



CEAST MF Series | Melt Flow Testers





INSTRON®

CEAST MF Series

Melt Flow
Testers

Keep Flow Under Control

Flow properties of molten plastics are a critical characteristic requiring good knowledge and control. The Instron® Melt Flow Testers are specifically designed for easy and accurate measuring of the Melt Mass-Flow Rate (MFR) and the Melt Volume-Flow Rate (MVR). CEAST Melt Flow Testers range from systems that perform a simple manual test procedure to semi-automated testing systems performing multiple weight tests.

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Why Measure Melt Flow?

MFR represents a typical index for characterizing thermoplastics.

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Which is the Right System for My Test?

Melt Flow Testers are ideal for standard procedures ranging from a quick manual test to a multi-weight characterization.

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What Results Do You Need?

From basic MFR calculation to Flow Rate Ratio (FRR) and basic rheologic analysis, Melt Flow Testers can be equipped with dedicated software maintaining the highest level of accuracy, repeatability, and reproducibility of results.

Meet My Testing Needs

Thermoplastics are versatile materials used to manufacture a variety of products, ranging from toys to shopping bags, from kitchenware to automotive parts, from textile fibers to medical consumables. They are often handled as hot viscous fluids in the Chemical and Manufacturing Industry because they are mixed and shaped in the molten state within typical temperatures from 100 to 400 °C (212 to 752 °F).



Incoming Material Acceptance

Are you a raw material producer? If not, you may have one or more suppliers for the materials used in your process. Are the properties of each new lot delivered according to specifications? Are you sure that incoming materials won't generate process downtime, continuous tuning and adjustments, or quality issue on your product? A Melt Flow Tester is normally used to check the consistency of incoming materials by measuring the Melt Flow Rate (MFR/MVR) of samples. For a more accurate investigation on material properties, the next step is to determine the Flow Rate Ratio (FRR), which can be more efficiently obtained with multi-weight tests.

Quality Control

According to standard requirements: to certify your company as a reliable manufacturer and supplier, every single step – from raw material to finished product – requires Quality Control with suitable procedures. When the thermoplastic materials being processed in the molten state need to be kept under control, one of the key tests is MFR. If something changes in the flow properties of the material, your process can become out of control, contributing to poor product quality, randomly variable energy and material consumption, reduced efficiency due to unexpected downtime for adjustments, and scrapping of whole batches. MFR tests allow for a quick determination of flow properties by means of a simple procedure particularly suitable for Quality Control. A Melt Flow Tester is suitable for any industrial environment and can be operated correctly after simple training.



Product Development

If your laboratory is working with thermoplastic materials, you will need to check the flow properties by comparing values as per standard industrial procedures. The MFR is typically part of the data sheet of a material and can be used to indirectly evaluate other properties. In fact, it's an index for molecular weight, physical and chemical degradation, and quality of additives and compounds. FRR results indicate qualitative differences for Molecular Weights Distribution and Non-Newtonian Flow Behavior.

Process Optimization

Is your lab's testing activity aimed at optimizing an existing industrial process – or designing alternative ones? If so, the MFR of processed materials is a good reference value. When you select different materials or formulations, MFR and FRR will roughly estimate their viscosity and shear sensitivity. Looking for better processing conditions, you can check the corresponding behavior of the material through the MFR. Process simulation and advanced characterization require Capillary Rheometers. However, MFR is normally available from routine Quality Control tests once the process is running.

Research and Teaching

The Melt Flow Rate determination is a good link between research laboratory and the industrial world. MFR tests are so common in the industry that researchers and students need some exposure to these testing procedures and related data interpretation. New materials and processes will ultimately be subjected to quality control procedures based on Melt Flow tests.

Selecting the Right Melt Flow Tester for Your Applications

Procedure A (ISO 1133-1/-2*, ASTM D1238)

Widely used for basic quality control, this is a mass-measurement method where the operator must weigh portions of the extruded material cut at precise time intervals. The Melt Mass-Flow Rate (MFR) result is directly obtained by dividing the Extrudate Mass by the corresponding Extrusion Time. Standards recommend that this procedure be limited to MFR ranging from 0.15 – 50 g/10 min.

Procedure B (ISO 1133-1/-2*, ASTM D1238)

As the most common procedure for Melt Flow tests, this is a volume-measurement method where the instrument uses a piston displacement transducer (encoder) and a synchronized timing device to perform a semi-automatic test. The instrument calculates the Melt Volume-Flow Rate (MVR) and multiplies this by the melt density giving an MFR value. The melt density value can be either known in advance or calculated by the instrument using the value of extrudate mass.

Procedure C (ASTM D1238)

This is a modification to Procedure B and applies to fast-flowing materials (e.g. MFR of 50 g/10 min or greater). It requires a different die geometry (“Half Die”) and a Die Plugging Device to avoid excessive leakage of the material before beginning measurements. The use of Half Die is also foreseen by ISO as an option within Procedures A and B.

Procedure D (ASTM D1238)

This is an extension of Procedure B to determine the multi-weight Melt Mass-Flow Rate. With a single test, the instrument provides multiple MFR and MVR results, one for each test mass applied in a sequence. Another result is the ratio between flow rates obtained with different masses, called Flow Rate Ratio (FRR) or Shear Sensitivity. Procedure D is used when multiple testing conditions and FRR data are routinely required for each sample. While ASTM defines a dedicated procedure, ISO mentions Multi-Weight tests within Procedure B.



CEAST MF20

Single-Weight Tests According to Procedures A, B, and C



CEAST MF30

Single-Weight Tests According to Procedures A, B, and C with Controlled Compacting and Purging



CEAST MF50

Single-Weight and Multi-Weight Tests According to Procedures A, B, C, and D

*Note on ISO 1133-2

This part of the ISO standard for Melt Flow Tests was introduced at the end of 2011. It is aimed at ensuring MFR results with good accuracy also for materials that are particularly sensitive to moisture or time-temperature history. It specifies tighter requirements for temperature accuracy and stability of Melt Flow Testers and very accurate calibration procedures. It also underlines that adequate and very reproducible sample handling and conditioning (drying) is critical, as sometimes detailed by specific standards dedicated to each type of material. Typical materials that are considered sensitive are: PET, PBT, PEN, other polyesters, PA (Nylons), Thermo-Plastic Elastomers (TPEs), and Thermo-Plastic Vulcanizates (TPVs).

CEAST MF20

CEAST MF20 is a versatile Melt Flow Tester for single-weight tests, compliant with the latest international standard requirements for temperature accuracy and stability. It is an ergonomic and compact system designed for easy and safe testing and maintenance.

Standard Features

- High accuracy and stability of temperature according to ISO 1133-2
- On-board interface for method setting and visualization of results
- Standard tungsten carbide die
- Quick-release slide system for the die
- Guided piston design for accurate positioning into the barrel
- Integrated support for accessories and consumables

Options

- Manual Mass Selector to avoid mass handling and configuration changes
- High-Precision Encoder to measure MVR, up to 40 data points acquisition for a single test
- Corrosion-resistant barrel, pistons, and dies for chemically-aggressive materials
- Manual or Motorized Melt Cutting Device
- Integrated device for barrel cleaning
- Die Plugging Device to prevent material flowing during pre-heating
- Wide range of test masses and dies for all materials and testing standards
- VisualMELT Software for PC control and advanced data analysis



A Optional high-precision encoder

B Vaste range of masses

C Optional melt cutting device

D Optional die plugging

CEAST MF30

CEAST MF30 is an advanced, single-weight Melt Flow Tester that is compliant with the latest international standard requirements. Its ergonomic and compact system allows for easy and safe testing and maintenance.

Standard Features

- High-Precision Encoder to measure MVR, up to 40 data points acquisition for a single test
- Lifter for automatic and accurate test mass application
- Unique Load Cell for compacting and purging with a controlled force
- High-temperature accuracy and stability according to ISO 1133-2
- On-board interface for method setting and visualization of results
- Integrated support for accessories and consumables

Options

- Manual Mass Selector to avoid heavy mass handling and configuration changes
- Manual or motorized extrudate cutting device
- Integrated device for barrel cleaning
- Die plugging device to prevent material flowing during pre-heating
- Corrosion-resistant material for barrel, piston, and dies
- Magnetic Fastening system for piston holding during resting phase
- VisualMELT Software for PC control and advanced data analysis



A Standard load cell for compacting and purging

B Standard lifter for automatic test mass application

C Standard high-precision encoder

D Support for accessories

E Optional die plug

F Optional melt cutting device

Manual Mass Selector

Available for CEAST MF20 and MF30, the integrated Manual Mass Selector simplifies configuration and testing, and ensures outstanding operator safety. With minimal physical effort, there is no heavy mass handling required and the configuration of the machine always remains the same.

The standard set of masses enables the following test conditions: 0.325 (mass of piston) -1.2, -2.16, -3.8, -5, -10, -12.5 and -21.6 kg (masses tolerance $\pm 0.5\%$ according to international standards with extremely easy verification and maintenance).

- All masses remain installed at all times on the special support
- The device features a series of mechanical and electrical solutions to prevent hazardous situations and ensure trouble-free operation
- Special sets of masses are available on request
- Does not require compressed air supply



Solutions for Safety and Efficiency

The Challenge

Many testing laboratories in the industry have a Quality Control role foreseeing tests run on a regular basis, plus a support role on demand in case of processing issues or new developments. QC roles focusing on several different products may require various conditions, while additional conditions are likely to be required by the other activities. Therefore, the users of such labs need to change test masses several times a day, performing multiple tests and thoroughly cleaning the equipment after each test. With a basic Melt Flow Tester this may generate a few safety concerns (handling of heavy masses) and requires a lot of time and physical efforts for cleaning.



Our Solutions

CEAST MF20 and MF30 Melt Flow Testers can be equipped with the Manual Mass Selector, plus an integrated barrel cleaning device. Furthermore, MF30 has an integrated load cell used for controlled material compacting and for quick and effortless purging of the material left in the barrel after measurements. These options make life much easier for the lab operator, with significant savings in terms of time, physical efforts, and safety concerns. The working area remains organized since all test masses and options remain attached to the main machine.

CEAST MF50

CEAST MF50 is the premiere Melt Flow Tester for single-weight and multi-weight tests. With outstanding technical features and a higher level of automation, safety, and user-friendliness, it is compliant with the latest international standard requirements for temperature accuracy and stability.

Standard Features

- Touchscreen User Interface with embedded PC and data storage capability
- High-temperature accuracy and stability according to ISO 1133-2
- Tilting oven for easy inspection and cleaning
- Interlocked full safety shield enclosing masses, piston and encoder area
- Integrated system for automatic mass selection
- Pre-installed set of eight masses (different sets available)
- High-accuracy encoder ensures great results, precision with up to 50 measurement points in one test



A Multiple weight sets

B Optional semi-automatic cleaning

C High-accuracy encoder

D An oven-mounted tilting support

E Touchscreen control panel

Options

- Load Cell for sample compacting and purging with controlled force (up to 750 N)
- Different sets of masses for the integrated weight changing system
- Acid-resistant version for chemically-aggressive materials
- Motorized cutting device for easy collection of extrudate to be weighed
- Manual or automatic die plugging device to prevent material flow during pre-heating
- Go/No-Go gauges for die tolerance check
- Nitrogen blanket device for hygroscopic materials testing
- Integrated barrel cleaning device for easier and faster operation
- VisualMELT Software for external PC control and advanced analysis
- Automatic Mechanical Piston Holding Device for high-flow samples



Repeatability and Reproducibility Matter

CEAST VisualMELT Software is available for controlling the functionality of the full line of Melt Flow Testers for QC or R&D purposes. With optional Multi-Modules, testing operations can be carried out simultaneously on multiple instruments.



Single-Weight Test Results View

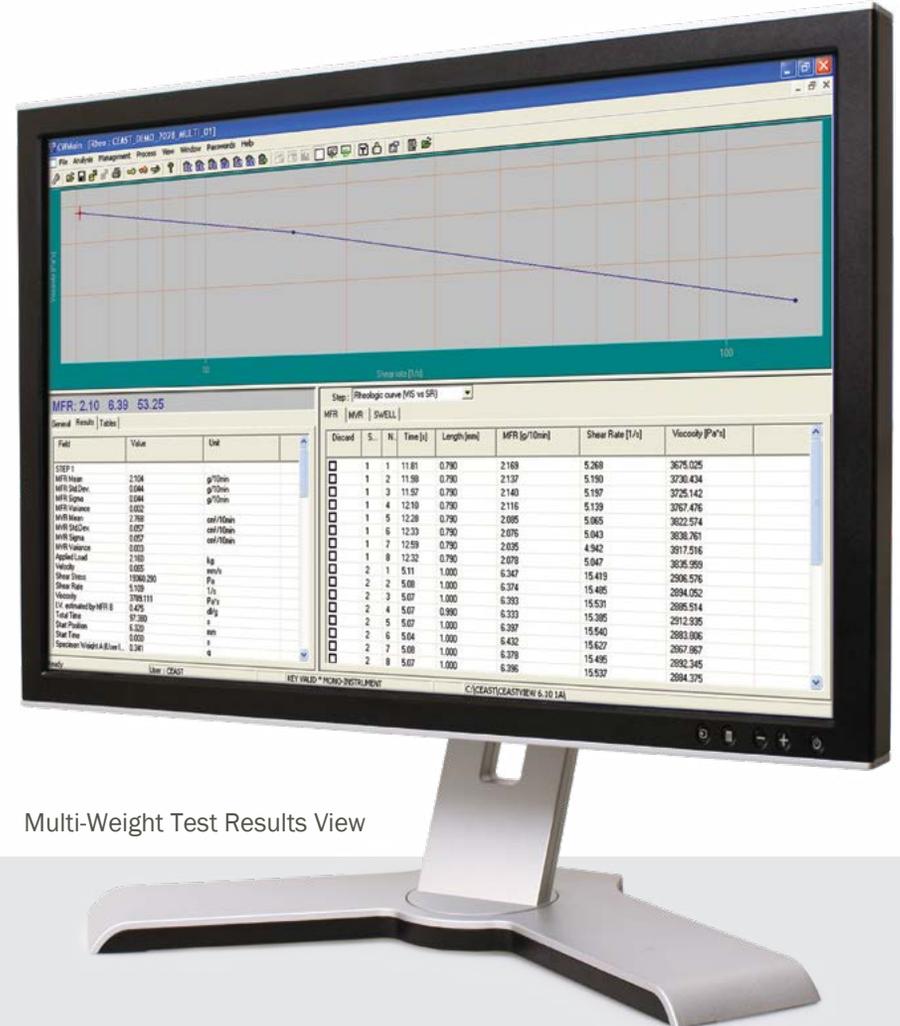
VisualMELT manages the complete test procedure with:

- Access through passwords that are defined for each user level
- Editing and Storage of Test Methods - parameters can be chosen from a built-in library of international standards or customized according to your testing needs
- Instrument Status Window and Real-time Graphs support test execution
- Data Acquisition and Storage - a wide database that can be created and searched
- Automatic Calculations of Test Results according to international standards
- Data Validation - different criteria are available for selecting and removing data in either automatic or manual mode
- Test Measurement Length can be automatically selected according to ASTM requirements (1/4 inch or 1 inch depending on the flow rate measured during the test - currently available for MF50)
- Report Management
- Data Export

The software enables the user to manage optional devices, including Load Cell, Motorized Cutting, Motorized Weight Lifter, Die Plugging, and Piston Holding. Working with a multi-weight tester, it is possible to set up and control single-weight or multi-weight tests, defining the order and number of weights to be applied.

Available Results

- MFR, MVR, FRR
- Intrinsic Viscosity (I.V.) estimated through correlation with MFR data
- Graphs and numerical data for the whole test
- Basic statistical analysis of data
- Shear Rate, shear stress, and viscosity (flow curve from multi-weight tests)



Multi-Weight Test Results View

Support for the Life of Your Equipment



When You Need Us, We're There

Operating with 25 offices in 18 countries and more than 1,200 employees, Instron® has a global infrastructure that is local to you. When you need service and support for your CEAST Melt Flow Series equipment, we'll be there. We remain committed to advancing materials and components testing techniques.



Maximize Uptime

The Instron world-class service organization is committed to delivering high-quality installation, calibration, training, maintenance, and technical support throughout the life of your CEAST Melt Flow Tester. We help to ensure that your system is working when you need it.



Quality Standards You Can Trust

Operating under ISO 9001 quality standards and with an extensive list of accreditations, Instron employs a product design philosophy where our customers' data integrity, safety, and protection of investment are paramount. We strive to ensure that our customer satisfaction is second to none.

Specifications



CEAST MF20



CEAST MF30



CEAST MF50

Type of Test		MFR, Single Weight (and MVR with Optional Encoder)	MFR and MVR, Single Weight	MFR and MVR, Single Weight and Multiple Weights (up to 5 Test Masses in One Test)
Encoder		Optional	Included	Included
Weight Lifter		Optional (Standard Type)	Included (N/C Controlled Type)	Included (N/C controlled type, integrated)
Load Cell		Not Available	Included	Optional
Melt Cutting Device		Optional, Manual or Motorized	Optional, Manual or Motorized	Optional, Motorized
Test Mass Selector		Manual Mass Selector (Optional) (Requires Weight Lifter)	Manual Mass Selector (Optional)	Automatic Mass Selector (Included and Integrated)
Die Plugging Device		Optional, Manual (Basic Type)	Optional, Manual (Basic Type)	Optional, Manual (Equipped with Microswitch to Check Position), or Automatic (Pneumatic Action)
Integrated Barrel Cleaning Device		Optional	Optional	Optional
Piston Holding		Not Available	Optional Magnetic Fastening Piston	Optional Automatic Mechanical Holding Device
Test Temperature Range	°C	30 to 400	30 to 400	30 to 400
	°F	86 to 752	86 to 752	86 to 752
Temperature Accuracy and Stability		ISO 1133-2 (Exceeds ISO 1133-1) ASTM D1238	ISO 1133-2 (Exceeds ISO 1133-1) ASTM D1238	ISO 1133-2 (Exceeds ISO 1133-1) ASTM D1238
Barrel Material		Nitrided Steel with Superior Wear Resistance (Option: Nickel Alloy for Chemical Resistance)	Nitrided Steel with Superior Wear Resistance (Option: Nickel Alloy for Chemical Resistance)	Nitrided Steel with Superior Wear Resistance (Option: Nickel Alloy for Chemical Resistance)



CEAST MF20



CEAST MF30



CEAST MF50

User Interface		4-line LCD Display (Option: CEAST VisualMELT Software on External PC)	4-line LCD Display (Option: CEAST VisualMELT Software on External PC)	VGA Touchscreen Color Display Running Proprietary Windows CE Application (Option: CEAST VisualMELT Software on External PC)
Basic Machine Dimensions (w × d × h)	mm	540 × 370 × 475	540 × 370 × 795	800 × 645 × 1550
	in	21 × 15 × 19	21 × 15 × 31	32 × 25 × 61
Machine Dimensions with Options (w × d × h)	mm	585 × 500 × 1005	585 × 500 × 990	800 × 645 × 1550
	in	21 × 15 × 19	23 × 20 × 39	32 × 25 × 61
Basic Machine Mass	kg	50	60	150
	lbs	110	132	330
Machine Mass with Options	kg	100	110	160
	lbs	220	243	352
		With Mass Selector	With Mass Selector	With Cutter and Barrel Cleaning
Electrical Supply	V	115 or 230	115 or 230	115 or 230
	Hz	50/60	50/60	50/60
Other Facilities Required to Operate Basic Machine and Options		None	None	Compressed Air (5 bar) for Barrel Cleaning and Piston Holding Devices
Power Consumption		Max. 1000 W (Including Options)	Max. 1000 W (Including Options)	Max. 1000 W (Including Options)

Americas

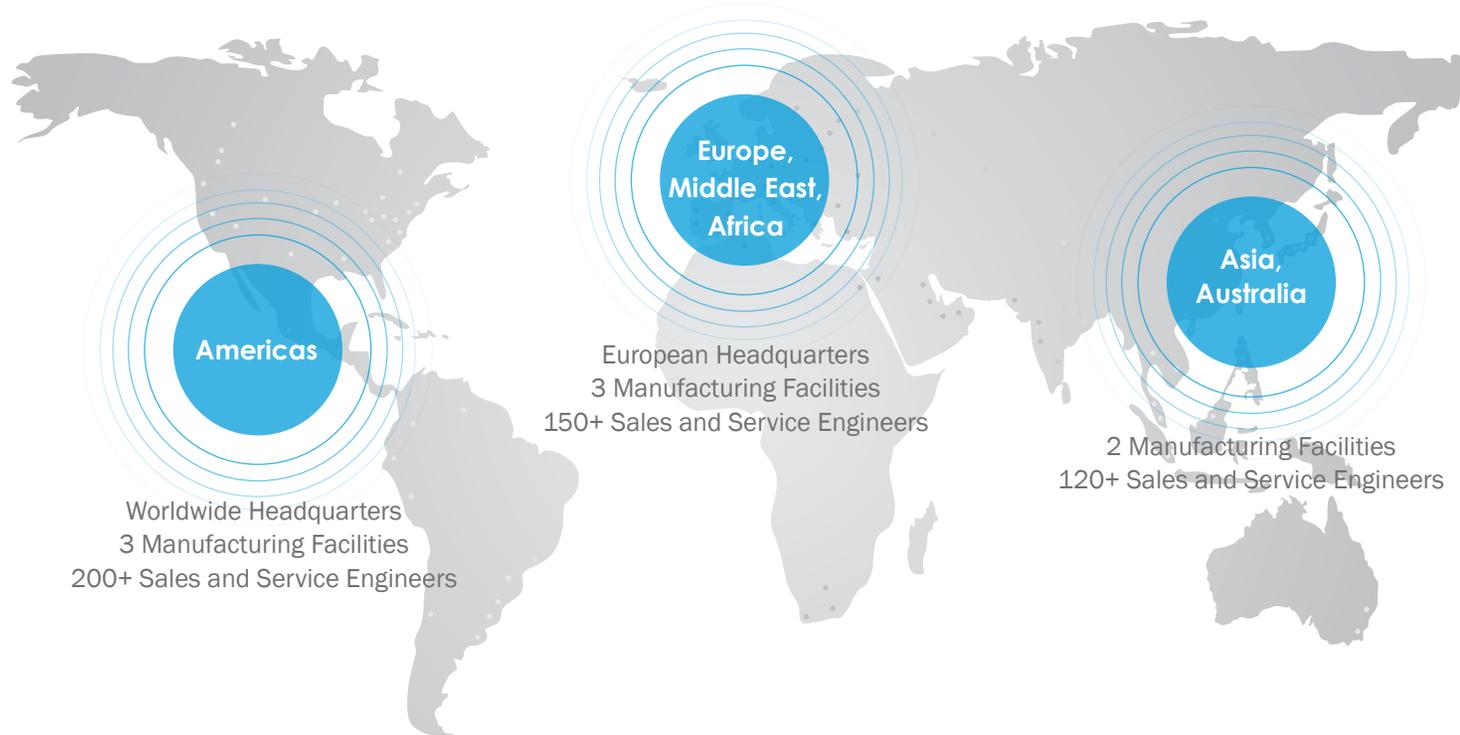
Brazil +55 11 4689 5480
Canada +1 905 333 9123
Central America +1 781 575 5000
Mexico +1 781 575 5000
South America +1 781 575 5000
United States +1 800 877 6674/1 781 575 5000

Europe, Middle East, Africa

Africa +44 1494 456815
Belgium +32 495 26 6627
France +33 1 39 30 66 30
Germany +49 6151 3917 0
Ireland +44 1494 456815
Italy +39 011 9685 511
Luxembourg +32 495 26 6627
Middle East +44 1494 456815
Netherlands +31 610 898 286
Nordic Region +44 1494 456815
Spain +34 93 594 7560
Switzerland +0800 561 550
Turkey +90 0 216 5621052
United Kingdom +44 1494 456815

Asia, Australia

Australia +61 3 9720 3477
China +86 21 6215 8568
India +91 44 2 829 3888
Japan +81 44 853 8530
Korea +82 2 552 2311/5
Singapore +65 6586 0838
Taiwan +886 35 722 155/6
Thailand +66 2 513 8751/52



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go.instron.com/CEAST

www.instron.com



Worldwide Headquarters
825 University Avenue, Norwood, MA 02062-2643 USA
+1 800 564 8378 • +1 781 575 5000

European Headquarters
Coronation Road, High Wycombe, Bucks, HP12 3SY UK
+44 1494 464646

CEAST Headquarters
Via Airauda 12, 10044 Pianezza TO, Italy
+39 011 968 5511

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