CONTROLS

CONSTRUCTION
MATERIALS
TESTING

GALILEO CONCRETE

A true Revolution
in the world of
Gyratory Compaction

EmS TECH

www.controls-group.com

GALILEO CONCRETE

Galileo Concrete is inspired from the renowned IPC Global Asphalt Mix Galileo Compactor that has been adapted to characterize concrete mix for zero slump and low workable concrete.

Incorporating innovations such as the Electromechanical Servoactuation and Orbital technologies, Galileo Concrete is designed to characterize the design of concrete mix using the gyratory compaction method according to a very popular method in Scandinavia.

This gyratory compaction method helps you to achieve the most reliable and cost effective concrete mix for concrete products plants, where low workable and zero slump concrete is used.

What's a zero slump concrete?

Zero-slump concrete, also known as no-slump concrete or earth-moist concrete, consists of a mass with a stiff consistency and low water content. These types of fresh concrete maintain, even in a fresh state, their original shape until the cement starts to set due to hydration, thus developing their usual strength. This special cohesive feature of the unhardened product is known as green strength.

Because of its green strength, zero slump concrete is often used for production of concrete products as these can be immediately stripped after the compaction process and quickly moved to a storing site without deformation or damage.

In order to optimize industrial production — that lowers processing times and makes best use of molds and machines — it is crucial to define an optimum concrete mix design. This can be done using a gyratory compactor.

How does the Gyratory Compaction Method work?

Gyratory compactors accurately reproduce in a laboratory the compaction of a no-slump concrete sample by applying vertical pressure combined with a gyratory movement. This compacts the specimen without the use of vibrating energy by applying a low-stress static compression together with a shear action.

Shear movement under pressure allows the particles to move closer to one another, increasing the density of the mix.

This compaction method accurately and conveniently evaluates the compaction behavior and workability of granular mixtures as the machine provides a precise and defined compaction action. It is used for Mix Design and Quality Control of no-slump or low workability concrete, mainly used in concrete product plants.

In conclusion, a giratory machine is a highly sensitive testing system capable of differentiating mixtures characterized by minor changes in order to obtain the concrete mix best fit for production purposes.

Why use the Gyratory Compaction Method?

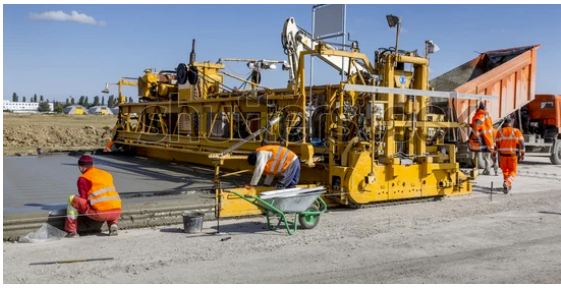
- To evaluate the mix design with a highly sensitive testing system capable of differentiating mixtures characterized by minor changes.
- To simulate selected production processes for optimum mix design.
- To evaluate the mix design with ease and achieve the correct dosage of cement, water and admixtures.
- To achieve the right balance between the required compaction energy and the concrete's optimum durability / mechanical resistance.
- To calibrate and check a plant's compaction energy by accurately evaluating a concrete's volumetric properties.
- To constantly monitor any changes in the mix production by performing easy Quality Controls checks.
- To prepare samples (fresh and cured) ready for strength testing and evaluation of other mix-related parameters (workability, curing time, etc.)

Truly Innovative

A resilient Testing System that incorporates the use of the Electromechanical Servoactuation mechanism, a Smart Control Panel and unique Orbital system.

Sophisticated engineering with Electromechanical Servoactuation technology and "Orbital" system
A robust, precision-engineered steel structure, incorporating the Electromechanical Servoactuation (EmS) mechanism for vertical load application and "Orbital" proprietary gyration and mold rotation system (patent pending) which delivers highly accurate and repeatable test results, together with stiffness and angle stability values that fall comfortably within the limits defined by the Scandinavian Standard NT BUILD 427 "Concrete, fresh: Compactability with IC-tester (Intensive Compaction tester)". The large user-friendly integrated color touch screen control panel shows the test graph in real time.

A global system with multi-lingual software
The on-board firmware includes nine languages and also offers the option to control the tests from a PC. The language can similarly be defined in the PC software, making the systems easily configurable to local user needs.



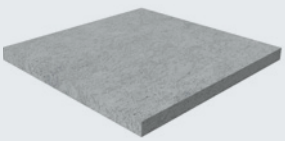
Typical Applications of no slump concrete

- Production of concrete products
- Concrete roads
- Gravity dams

Ideal for concrete plants using No-Slump Concrete mixtures

Below are typical examples of concrete products where no-slump concrete with low workability is used.

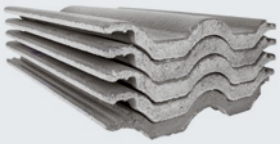
→ PAVING BLOCKS



→ PAVING SLABS

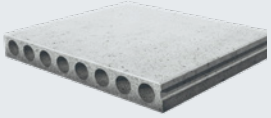
→ MASONRY BLOCKS

→ KERBSTONES



→ ROOFING TILES

→ SEWERAGE PIPES



→ HOLLOW CORE SLABS

Fully Electromechanical

Fully Electromechanical — No Compressed Air Required

- High precision, robust loading mechanism combined with an extremely rigid frame assures high accuracy and repeatability.
- Load cell fitted directly on the vertical actuator for accurate load measurement and feedback control.
- On request, real time torque resistence measurement (Nm) and calculation of shear values (kN/m^2) by PC software during compaction. These parameters are useful for a deeper evaluation of components selection/dosage and tuning of no-slump concrete mixture.
- Quick and easy manual / mechanical adjustment of the gyratory angle, shown on the display. On request, accurate automatic motorized regulation of the gyratory angle, dispalyed and set from the touch-screen (or PC software).
- User defined axial stress and speed of rotation.

CONFORMING TO SCANDINAVIAN STANDARD
NT BUILD 427

- Zero-angle test-end function to obtain samples with faces perpendicular to the cylinder axis (optional).
- Easy control using the integrated 7" color touchscreen control panel or connected PC.
- User friendly PC software (optional) for data analysis and test set-up.
- Automatic data saving on USB or on Windows PC.
- Easy specimen extraction with the manual (included) or integrated (optional) extruder.
- Safe and easy mold insertion and extraction with automatic lifting ensures low effort for the operator and higher productivity.
- Sliding transparent door with safety interlock.
- Catch tray to collect expelled water.

Specifications are quite different from the asphalt gyratory compactor's as the giratory angle is higher, vertical pressure is lower and working speed is higher to better simulate the concrete behavior during compaction.

NT Build 427

WHAT YOU NEED TO KNOW

The NT Build 427 method is used for Mix Design and Quality Control of low workable and zero slump concrete. It specifies the following testing requirements for fresh concrete Gyratory Compactor:

- 40 mrad (2°17') gyratory angle (it can be adjustable)
- From 40 to 120 cycles/min working speed
- Vertical pressure adjustable up to 320 kPa (it has to be adjustable down to very low pressure, 50 or 60 kPa, to meet the variety of workability behaviour of the mixtures)
- 100 mm diameter mold

Ingenious Orbital Motion

Unique to Galileo Giratory Compactors

Orbital is the unique and ingenious (patent pending) system at the heart of Galileo Gyratory compactors.

How it works

The ORBITAL system is characterized by the rotation of the mold around its inclined axis and the micrometrical adjustment of the gyratory angle from 0° to 3° (figure 1). The result of the load pressure on the specimen and the self-balancing tendency of the gyratory axis keep the mold against two roller bearings placed on 120° at the rear, leaving the front access and the entire front of the machine completely free.

The gyratory motion of the specimen is generated by the rotation of the mold around its own axis. An external observer sees the mold rotating around its own inclined axis on the pre-set gyratory angle (figure 2A). However, if the observer was positioned at the specimen centre, he would see the gyratory motion of the specimen itself (figure 2B).

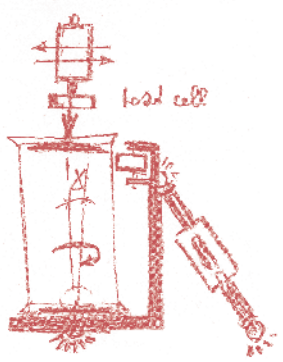


Figure 1

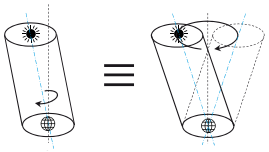


Figure 2A Figure 2B

Benefits

Much higher performance than standard requirements

The simple rotation of the mold around its own inclined axis on the pre-set gyratory angle ensures a precise and regular motion, maintaining the gyratory angle constant at all stages of rotation and therefore throughout the test.

The direction of the reaction force to the gyratory angle is constant. This allows the machine frame to be very simple yet extremely rigid. The result is test parameters which far exceed the Standard requirements and declared in the calibration certificate supplied with the machine.

Simple and lightweight mold design

The gyratory motion and maintenance of the gyratory angle do not require sliding and friction-affected mechanisms; instead the mold rests on two roller bearings, which also ensures silent, regular and precise motion. The mold's thickness and hardness conform strictly to standards. It has no bumps or appendages and it is light, easy to handle and hardwearing.

Easy mold placement and removal

Access to the front is completely free. No locking / unlocking operations are required to place or remove the mold.

An automatic lifting-lowering mechanism moves the mold on sliding PTFE guides making insertion and or extraction of the mold effortless.

High productivity

The extrusion of the specimen while another test is in progress (and the optional integrated balance) enables continuous use of the machine for high productivity.

Integrated shear resistance measurement

Measurement of shear stress and resisting torque is integrated in the machine.

No accessories are required, thus avoiding any gyratory angle inaccuracies.

Intuitive Software and Smart Controller

Galileo systems include a smart controller with a wide 7" 16:9 color touch screen control panel.
An intuitive and user friendly graphical interface with clear, high contrast design pictograms allows for:

- User input of test parameters, choosing from preset pattern related to relevant standards or user customizable patterns. The servo-controlled operation of the machine allows vertical stress, rate of gyration and gyratory angle (as optional) to be quickly modified from the control panel or PC.
- Displaying and plotting either:

  ▶ **height** ▶ **load** ▶ **density** ▶ **torque resistance** ▶ **angle** ▶ **compaction energy** against gyratory cycles in real time.

  Test data may be stored and retrieved or transferred to other software analysis packages.
- Calibrating of transducers with a highly accurate interpolation to assure the most precise data acquisition.
- Guided test procedure to help and assist the operator throughout the compaction procedure steps.

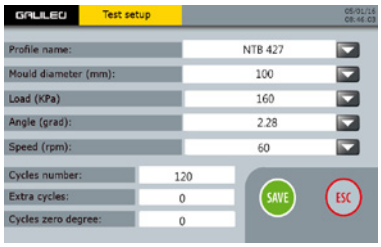
The PC software in addition allows:

- remote control of the machine.
- calculation, display and plot (when shear measurement system is provided) of shear values and compaction energy.
- evolution over the number of gyrations of all the volumetric parameters: height of sample, density, AV% (% Air Voids in the sample), VMA% (% Voids in Mineral Aggegates) and % VFC (% Voids Filled by Cement).
- creation of test groups, composed by 1 to 4 tests, to compare different mixes for Mix Design purposes.

Parameters menu

User selectable parameters, for standard and custom tests:

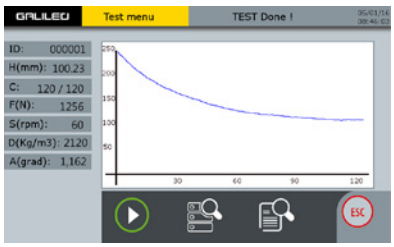
- One preset pattern to NTB 427
- Nine user customizable patterns:
  - Vertical load and gyration rate
  - Number of gyrations
  - Target density (or vertical height)
  - Angle (optional)



Test menu

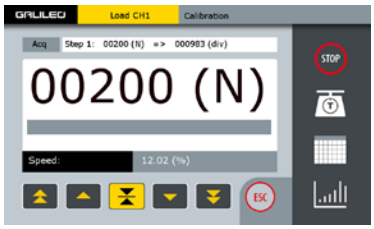
Real time graphical representation of the transducers readings:

- Height
- Density
- Angle
- Torque resistance (optional)



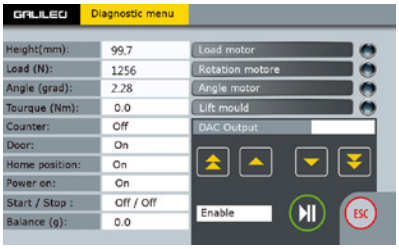
Calibration menu

Accurate calibration of transducers with six (or more) interpolation points in order to achieve certification far exceeding requirements of the international standards.



Diagnostic menu

Quickly checks all electronic components and devices such as Load cell / Displacement transducers / Servodrive.



Ordering Information

Main System

54-C20C02 Galileo Concrete fully Electromechanical Gyratory Compactor Includes 100mm dia., mold and manual extruder.
230 V, 50/60Hz, 1ph.

54-C20C04 Same as above but working at 110 V, 60 Hz, 1 Ph

Ugrading Options (To be specified at time of order)

54-C20C02/UP1 Shear measurement system.

54-C20C02/UP2 Integrated electromechanical extruder.

54-C20C02/UP3 Electronic balance 30 kg cap. x 1 g to weight the sample.

54-C20C02/UP4 Upgrading for the motorized regulation of the gyratory angle

Accessories

50-C20C02/2
Accessories to compact dia 150 mm specimens. Mould not included.

78-PV0250/2
Cylinder mold, 150 mm diameter. Complete with top and bottom plates.

78-PV0250/3
Distance plate, 150 mm diameter, 50mm high, for preparing short samples.

54-C20C02/SW PC Software

Spares

54-C20C02/1
Cylinder mold, 100 mm dia., complete with top and bottom plates.

Technical Specifications

Model	Galileo 54-C20C02
Consolidation pressure	10 – 1000 kPa for 150 mm diam. 25 – 2200 kPa for 100 mm diam.
Gyratory motion and vertical load	Electromechanical
Angle adjustment	Manual (included) / Motorized (optional)
Gyratory angle range	0 – 3° ±0.01
Gyratory angle measurement	Angle measured and displayed during test
Speed of gyration	5 – 120 rpm
Number of gyrations	0 – 9,999
Integrated Shear Measurement	Yes (optional)
Molds dimensions	100 mm and 150mm diam., 250 mm high
User interface	7" 16:9 Touch screen color display (PC for data analysis)
Connection	LAN – Ethernet
PC Software	Yes (optional)
Extruder	Manual (included) / Motorized (optional)
Balance	Yes (optional)
Minimum specimen height	50 mm
Maximum specimen height	Up to 200 mm depending on Mix type
Height accuracy	Better than 0,1mm
Suitable for water pouring test	Yes
Dimensions (w x d x h)	480 mm x 900 mm x 2150 mm
Weight approx.	400 kg

CONTROLS

CONTROLS Customer Care

As one of the longest established manufacturing companies in the world of Construction Materials Testing solutions, we are dedicated to supplying high quality, accurate, affordable, easy to use systems.

As a valued customer of CONTROLS, you will receive continuous, expert support and advice for your equipment. Furthermore, we can offer full installation and training in the correct operation of your CONTROLS equipment.

For support from our expert Customer Care Team, contact your local CONTROLS office / distributor or email **customercare@controls-group.com.**

For more information, please visit **www.controls-group.com.**

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