TF-Technologies is a leading manufacturer of machine control specifically for the road paving industry. Since the establishment in 1978, our single focus has been to develop and produce high-quality electronic control solutions for road paving machinery. Every day, the people at TF-Technologies are in direct contact with the users of the equipment. The specific needs of road construction players, machine producers and users alike, are at the heart of everything we do.

TF-Technologies aims at offering innovative solutions improving results on any paving or milling job. Our equipment will help you optimise material usage, significantly improve mat quality, ensure optimal working conditions for the crew and increase productivity.

All TF-Technologies machine control products are very user-friendly and highly durable, specifically designed to work in the rugged environment of a road construction worksite.

We believe this is what you need to achieve optimal results on any paving or milling job.

This catalogue will guide you through all the solutions we have available for you to improve your particular road paving job. Rest assured it gets the job done, as all product lines have been thoroughly tested and tried through years of use in the field.

Want more information?
Go to our website www.tf-technologies.com to read more about our products, see our products in action, watch product demonstration videos and more.

Like what you see?
If you are interested in purchasing any of our products or would like further information call us today! We will be happy to support you, or guide you to a sales representative or distributor covering your area.
paving a road, material, manpower and mistakes are expensive. Increasing productivity, reducing operating costs and preventing mistakes, while still ensuring a high-quality mat is vital for any contractor.

Mini-Line® Grade and Slope Control System does just that.

By controlling and maintaining the grade automatically, Mini-Line® improves smoothness of the road and ensures fewer operator mistakes, which results in a higher quality paved mat.

Automating the positioning and control of the grade and slope, also means less manpower required to operate the screed as only occasional supervision is needed, thereby increasing the productivity of the crew and reducing operating costs. Controlling the grade and slope with millimeter precision also means the operator can pave closer to the minimal required paving thickness and optimise material use.

WHEN MINI-LINE® GRADE AND SLOPE CONTROL SYSTEMS

Advantages
• Millimeter precision and increased mat smoothness
• Non-contact system with no wear and tear
• Simple to operate and easy to install and remove after use
• Fits all machine types
• Modular system allows you swap equipment around the entire paver fleet, and mix and match for the specific paving job
• Highly durable technology and reliable results

Mini-Line® is a non-contact system that operates with advanced ultrasound technology, which has several benefits over traditional mechanical systems.

Non-contact ultrasonic sensors entail no wear and tear as compared to traditional mechanical systems. With sonic sensors the operator does not need to worry about the system when lifting or lowering the screed, as opposed to mechanical systems where the ski must be repositioned.

Mini-Line® Grade & Slope Control System is available in a wide array of combinations, and can be setup flexibly for any paving job. Your preference and paving job determines the best setup, and as most compact system in the field, the system it is easily installed, removed or re-configured the crew and job at hand.

The system is very simple to operate. LED displays on sonic sensors, handset and control box allow the operator to quickly view, understand, and control the settings and measurements of grade and slope.

Mini-Line® sonic sensors are among the most accurate sensors in the field. The rugged transducer technology, specifically developed for harsh environments, has a very high durability and requires next to no maintenance.
G221 SONIC SENSOR

- Resilient sensor element
  - Highly resilient encapsulated ultrasonic transducer specifically designed to operate in an aggressive environment.
- Reference bail
  - Snap-on reference bail for optimum temperature compensation, designed to detach from the sensor body if struck by an obstacle to prevent damaging the bail or sensor.
- LED panel
  - High-visibility LED panel for instant visual indication of how the current mat thickness is following the set reference.
- Rugged housing
  - Aluminium housing for high durability and low weight for easy handling.

SNAP CONNECTOR

- The snap connector reduces installation time and makes the system even more user-friendly.

HS301 HANDSET

- Handheld controller
  - Rests comfortably in one hand, enabling the operator to walk around the screed during operation. Quickly mounted or dismounted in the mounting bracket or with the bail.
- Simple buttons
  - Extremely user-friendly interface for simple operation, reduced training time and operator mistakes.
- LED panel
  - LED panel with high visibility in both bright and poor sunlight gives the operator and crew a visual indication of how the current mat thickness is following the set reference.
- Indicators
  - Clear LED status indicators for millimetre precision grade and slope control.
- Rugged housing
  - Electronics well protected against external environmental factors in the strong aluminium housing.

SINGLE-SENSOR CONFIGURATION

WITH our single sensor configuration you’ll be ready to pave in no time. Connect one cable and you are ready to go. To commence paving set the reference and enter auto, and this system keeps it there. While paving, the operator can easily make any necessary adjustments of the mat thickness with the touch of a button. At any time, the operator can monitor how the current mat thickness is following the set reference by looking at the LED indicators of the handset.

All this to ensure a perfect result - every time!

Used for:
- Joint matching
- Curb sensing
- Ground sensing
- Slope sensing

WITH SINGLE-SENSOR CONFIGURATION

Used for:
- • Joint matching
  - • Curb sensing
  - • Ground sensing
  - • Slope sensing
**MINI-LINE® GRADE AND SLOPE CONTROL**

**Mini-Line®**

**SLOPE S298**
- Strong and accurate inclinometer specifically designed to withstand high vibration levels on high compaction screeds
- Extremely compact
- High measuring accuracy of +/- 0.1%
- Measures slope from either right or left side of the paver

**SOLP SENSOR**

- Optimised transducers
- Four ultrasonic transducers operating at an optimised frequency to precisely measure the distance from the sensors to the reference
- Reference bail
- Snap-on reference bail for optimum temperature compensation, with the Mini-Line trademark bend eliminating faulty measurements in light rain
- LED Panels
- High-visibility LED panels for instant visual indication of how the current mat thickness is following the set reference

**G224 MULTI SONIC SENSOR**

- Indicators
- Clear LED indicators displaying whether the sensor is on string or moving too far away from the it in string-line mode
- Rugged housing
- Strong aluminium casting resistant to corrosion and a tough environment

**MULTI-SONIC CONFIGURATION**

**THIS**
This configuration is highly versatile and can be used both for ground and string-line applications.

Adding a slope to the configuration gives you the ability to place a mat at a specified slope, or ensure a perfect grade even if you are missing a suitable reference in one side.

**Used for**
- All uses under ‘Single-Sensor Configuration’
- String-line sensing
- Ground sensing with small-scale averaging effect
- Sloped curb sensing

**HS301 Handset**
- Width - 13 cm
- Depth - 4.5 cm
A mobile reference to extend the relative wheelbase for an automatic screed control system is a well-proven method to average the deviations of the existing pavement surface thereby obtaining a smoother mat.

In opposition to rigid mobile references, the Mini-Line® averaging system features a non-contact reference with four sonic sensors distributed across two horizontal beams. The non-contact beams ensure high maneuverability and are able to ignore isolated deviations in grade for instance when going over a large rock or other obstacles.

Four sensors take individual measurements across the entire length of the asphalt paver and the average of these measurements constitutes the base of grade regulation. Rough spots in the existing foundation, which normally would affect the quality of the new road, are effectively evened out.

The result is a significantly smoother road surface using less material and finished in less time.

When not in use the averaging beams fold up easily and are out of the way. The beams come fully-fitted with connector boxes and all cabling integrated into the beams, making installation super simple. The split beam setup provides for easy handling, and makes it more flexible allowing the operator to easily move around the machine.

Additionally, the split beam provides the operator the freedom to use half a beam on each side of the machine for mounting single-sensor configurations, when an averaging system is not required.

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**AVERAGING CONFIGURATION**

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Averaging beam with four G224 Multi-sonic grade sensors

ADVANCED AVERAGING CONFIGURATION

Averaging System with Multi-Sonic Sensors and Advanced Control

**THE** advanced averaging configuration contains both the small-scale averaging technology across each Multi-sonic sensor and the large-scale averaging technology in the standard averaging beam configuration.

It also offers the operator an extended range of options for controlling and monitoring the system.

Exchanging the HS301 handset for a fixed PL2005 control box, provides the operator full control over both sides of the paver from one unit. Allowing one single operator to control both sides of the machine increases productivity of the crew, as it enables the other crew members to perform other tasks.

The PL2005 also has the added feature of enabling the operator to switch between running an averaging system and a single sensor system. With a simple touch of a button, the operator can toggle between the single sensor system and averaging system.

All units in the system are connected via the Mini-Line® control interface for easy installation adding the advantage of quick interchange of a cut cable.

**Used for**
- All uses under ‘Multi-Sonic Configuration’
  + Ground sensing with large-scale averaging effect
  + Controlling grade and slope in both sides from one unit
  + Switching between single-sensor system and averaging system

**PL2005 CONTROL BOX**

- Simple buttons: Simple user interface, one-touch operation for all basic functions with the option to toggle between single sensor system and averaging system.
- LED panel: The three displays allow the operator to simultaneously control and monitor the grade in both sides of the screed, as well as the slope. The left and right displays show the values of the active sensors, while the middle one allows the operator to monitor the readings from the non-active sensor.
- Turning knob: Allows you to make the necessary adjustments of the mat thickness easily by turning the panel dial.
- Indication: Visual indication of the connected sensors and their status.
- Rugged housing: Strong aluminium casting for high durability.
- Interface: All units in the system connected with Mini-Line® interface for easy installation.

**Slope Sensor S299**

Add a slope sensor for the additional features of slope control.

If one or more sensors detect a foreign object, e.g. a shovel or a stone, that measurement will automatically be excluded from the average calculation.

All sensor readings deviating >30 mm from the average are eliminated.

MINI-LINE GRADE AND SLOPE CONTROL
**MINI-LINE® GRADE AND SLOPE CONTROL**

**CHOOSE BETWEEN**
- one of the four Mini-Line® configurations

**Single-Sensor Configuration**
- 2 x HS301 handset with mounting bracket
- 2 x G224 sonic grade sensor with snap connector
- 2 x V-cable
- 1 x Slope sensor (optional)
- 1 x Carry case

**Multi-Sonic Configuration**
- 2 x HS301 handset with mounting bracket
- 2 x G224 multi-sonic sensor
- 2 x V-cable
- 1 x Slope sensor (optional)
- 1 x Carry case

**Averaging System**
- 2 x HS301 handset with mounting bracket
- 8 x G224 sonic grade sensor with snap connector
- 2 x V-cable
- 2 x I-cable
- 1 x Slope sensor (optional)
- 2 x Carry case
- 2 x Averaging beam with mountings

**Advanced Averaging System**
- 2 x PL2005 control box
- 1 x Interfacebox
- 8 x G224 multi-sonic sensor
- 7 x I-cable
- 2 x Machine cable
- 1 x Slope sensor (optional)
- 2 x Carry case
- 2 x Averaging beam with mountings

**OR MIX AND MATCH CONTROLLERS AND SENSORS**
- for your own preferred setup

**1 – Choose Controller**
- HS301 specs
  - Output (to valves): PNP or NPN max 1 2 A continuously, 2 A pulsed
  - Display resolution: Grade 1.0mm, Slope 0.1%
  - Control parameters: Sensitivity, Working window, Pulse width, Dead band
  - Operating temperature: -10°C to 70°C

**2 – Choose Grade Sensor**
- G224 specs
  - Sensor type: 4 x 125kHz ultrasonic transducer
  - Resolution: 1.0 mm
  - Sensor range: 250-920 mm ground mode
  - Operating temperature: -10°C to 70°C

**3 – Add Slope Sensor**
- G221 specs
  - Sensor type: 1 x 125kHz ultrasonic encapsulated transducer
  - Resolution: 10 mm
  - Sensor range: 320-900 mm
  - Operating temperature: -10°C to 70°C

**4 – Add Averaging beam**
- Averaging beam specs
  - Length: 5 - 11 m
  - Weight: 8 kg per beam

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FOR HS301

FOR PL2005

FOR G224

FOR G221

FOR S298 & S299

FOR Mini-Line®
A high quality milling job is often the first step in a high-quality paving job, but a precise milling job is not only a key foundation for a high quality road result. By only milling to the depth required, it reduces fuel consumption and machine wear, reduces costs to remove waste material, and cuts asphalt usage for the new layer.

LRL2000 Milling Control enables the operator to perform high precision milling jobs. The system is easy to use and works with or without averaging functions.

Connect up to six workstations to the main panel and place them anywhere convenient on the machine to provide complete control over the system from different work areas. All components of the system are connected via the Mini-Line® interface for easy installation.

How it works
The LRL2000 system for milling machines automatically maintains the desired depth and slope of the cutting lane of the machine. The depth is determined and maintained relative to a given reference point, which can be the road surface or another cutting lane.

The position of the machine in relation to the reference level is decided on an ongoing basis by the sensors connected to the LRL2000 control box, and the depth hydraulics are instantly regulated hereafter. Via the LRL2000 control panel, the operator has complete control of both sides of the machine, and depth and slope can be quickly regulated via a turning knob. LED symbols provide a good overview of which sensors that are in use and shows whether the hydraulics is active.

Advantages
- Easy to install and operate
- Fully serviceable and repairable
- Automatic and manual operation
- LED display with good visibility in both bright and poor sunlight
- Switch between single and averaging mode with a touch of a button

Averaging option
For superior smoothness, upgrade to an averaging solution! Add two ultrasonic sensors – G221 sonic sensor or G224 multi-sonic – press the averaging button and you are good to go.

With averaging, you can mill at variable grade and slope averaging out road imperfections even before paving begins, and thereby prepare a smoother surface for the new asphalt layer.

The result - a significantly smoother road surface.

Y398 Wirepull sensor
Wirepull sensors ensure immediate and accurate depth control using the position of the milling machine subplate as reference.

S297 Slope Sensor
High precision slope sensor specifically optimized to operate at the high speed required on milling machines.
- Super fast inclinometer ensuring immediate response sensor readings
- Extremely compact
- High measuring accuracy
- Measures slope from either right or left side of milling machine, and can be used for both monitoring and controlling the slope

LRL2000 specs
- Output (to valves): PNP or NPN, max 1.2A continuously, 2.0 A pulsed
- Measuring accuracy: +/- 0.25% (slope)
- Sensor range: 0 - 500 mm (Wirepull)
- Resolution:
  - Grade 1.0mm, slope 0.05%
- Control parameters:
  - Sensitivity, Working window, Pulse width, Machine width, Deadband, Single/Averaging modes
- Operating temperature: -10°C to 70°C
- LRL2000 panel
- LED display: Visual indication of the connected sensors and their status.
- Simple buttons: Simple user-interface with one touch operation for all basic functions and with the option to toggle between single sensor system and averaging system.
- Rugged housing: Strong aluminium casing for high durability.
- Interface: All units in the system connected with Mini-Line® interface for easy installation.

How it works
The LRL2000 system for milling machines automatically maintains the desired depth and slope of the cutting lane of the machine. The depth is determined and maintained relative to a given reference point, which can be the road surface or another cutting lane.

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MATERIAL CONTROL

Introducing the new AC700

A key precondition to laying a smooth pavement is using a material control system to maintain a constant head of material in front of the screed.

The AC700 monitors and regulates the level of material, ensuring a constant material flow to the level set by the operator. The AC700 is an ultrasonic non-contact sensor, which eliminates the problem of clogging material on mechanical sensors and removes the need for supervision and maintenance in use.

It can operate on both augers and conveyors and is easily operated with push buttons on an integrated keypad with a LED level indicator.

Controller and sensor is built into the same unit and is very easy to install – connect one cable and you are ready to go!

The AC700 is produced in several hardware versions to match the right output for different types of pavers.

Advantages

- Non-contact sensor
  As the sensor is not in direct contact with the hot mix it is extremely reliable with no wear and tear.
- Easily adjustable
  The two-button controls are very user friendly, even in tough working conditions.
- Versatile
  Can be used both on auger and conveyor, and available as both on/off and proportional as required by machine.
- Fully service-and repairable
  Open construction design enables repair.

LED panel
LED panel makes it easy to check the settings no matter where you are working on the paver.

Simple buttons
Two buttons make it easy to adjust the material flow to the desired level.

Optimised transducer
Ultrasonic transducer optimised for stable operation under high temperatures.

We coat the PCB with a conformal coating instead of filling up the sensor with potting resin. This makes our sensors fully serviceable and repairable and while ensuring that the condensation invariably building up in an environment with high temperature differences such as a paver is able to escape and does not build up inside the sensor.

<table>
<thead>
<tr>
<th>AC700 specs</th>
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</thead>
<tbody>
<tr>
<td>Output options: on/off or proportional, NPN or PNP, current controlled, voltage output</td>
</tr>
<tr>
<td>Adjustment steps: 21 mm</td>
</tr>
<tr>
<td>Sensor range: 200 - 1000 mm</td>
</tr>
<tr>
<td>Operating temperature: -10°C to 70°C</td>
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</table>
TEMPERATURE CONTROL

TF -Technologies is the world leader in temperature control systems for gas heated screeds. As a frontrunner in this particular area, we hold a number of product patents and are known worldwide as experts on the subject.

Controlling the temperature of the screed is critical in asphalt paving. Maintaining the correct operating temperature of the material throughout the screed is a precondition for producing an even surface with a perfect finish without overheating the screed plates.

The temperature control systems from TF-Technologies provide the ability to monitor and adjust the temperature of the screed, ensuring that optimum operating temperature is maintained throughout the paving job. With full automatic control of the screed temperature, costly mistakes are prevented and the operator can focus attention on the paving job.

At the same time, the system provides safety for the crew. By constantly monitoring gas ignition and closing the gas valves in case of ignition failure, gas-related accidents are effectively prevented.

As the number one supplier to paver equipment manufacturers within this area throughout the past fifteen years, the systems have a proven quality and an incredible track record. Available in a number of versions in order for you to get the right product for your exact need, the system can be fitted to suit any paver.

Advantages
- Optimum screed temperature maintained for a higher quality road
- Compatible with all gas heated screeds
- Fully automatic control and fault management
- LED display easy to read in any light (night and day)
- Simple, intuitive operation

FCB24/FCE24 Ignition boxes
The FCEB24/FCE24 ignition boxes are the cornerstone of the temperature control systems. With a FCB24/FCE24 ignition box you have both ignition and flame control, all in one box using only one electrode.

When power is applied the ignition box starts igniting. If the ignition box detects a flame, the yellow lamp will turn on and the ignition box will cease sparking. After this, the ignition box will continue to constantly monitor the flame, and as long as the flame is detected, the yellow lamp stays on.

In case the flame disappears, the ignition box will initiate sparking for seven seconds and the yellow lamp will stop lighting. If no flame is detected after seven seconds of sparking, sparking stops, and a red lamp turns on to indicate a fault condition.

The FCB24 and FCE24 ignition boxes are identical with regards to electrical specifications, function and connectivity, but differ by their physical dimensions to suit different preferences for installation.

Pt-100 sensor
The Pt-100 sensor is used in all temperature control systems for measuring the temperature. The sensor is a platinum RTD (resistance temperature detector) sensor, which measures temperature by correlating the resistance of the RTD element with temperature. It is connected to the rest of the system with a silicone cable protected in metal shield.

HOW IT WORKS

Ignition box controls ignition of the flame and monitors it. Upon ignition failure, it closes the gas valve as a safety measure to prevent accidents caused by gas seepage and presents an error code.

Pt-100 sensor is mounted on the screed and continuously measures the temperature of the screed and feeds the information back to the control module.

Thermostatic controller is the user interface which monitors the temperature of the screed via the Pt-100 temperature sensor, and controls the temperature to the level set by the operator by turning the ignition box on/off.

GAS

Ignition box regulates the gas supply by opening and closing the gas valve to maintain the set temperature.

Spark plug controlled by the ignition box ignites the gas.
SC5-96 TEMPERATURE CONTROL

The SC5-96 Temperature Control System is a single channel system monitoring the temperature of the screed with one Pt-100 temperature sensor, and regulating the burners and any potential fans via four ignition boxes. The SC5-96 control module is the user interface, where the desired temperature is easily adjusted with the turning knob. The operator can switch between manual and automatic temperature regulation with a simple flick of a switch, which ensures that the paver does not have to shut down in case of temperature sensor failure.

<table>
<thead>
<tr>
<th>SC5-96 specs</th>
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<tbody>
<tr>
<td>Output type:</td>
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<tr>
<td>Temperature control range:</td>
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<tr>
<td>Resolution:</td>
</tr>
<tr>
<td>Blower-run:</td>
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<tr>
<td>Operating temperature:</td>
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</table>

The SC5-96 Temperature Control System can also be used for asphalt containers/hot boxes. For use on asphalt containers/hot boxes, the manual mode option on the control module is removed as a safety measure to prevent overheating of the bitumen preventing explosion.

STC1600 TEMPERATURE CONTROL

The STC1600 Temperature Control System is a temperature control system with four channels that can control the temperature of the four sections of the screed individually.

On larger pavers environmental factors such as wind chill is affecting the screed differently across its full length leaving some parts overheated whereas other may be too cold.

The STC1600 Temperature Control System has two temperature sensors on the right and left side of the main screed, as well as one on each of the extensions.

With individual control of the temperature on each section, the system maintains an even temperature across the full length of the screed. The system controls the ignition and any potential fans for each burner of the four sections, so that they each constantly maintain the set temperature.

<table>
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<tr>
<td>Blower after-run:</td>
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<tr>
<td>Operating temperature:</td>
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</table>
JOINT HEATERS

Eliminate joint failures

JOINT heating minimise failures on the joint, resulting in a higher-quality road and allowing faster paving progress and considerable savings for the contractor.

How it works
The Joint Heater is an infrared propane/butane gas burner used on asphalt pavers, assisting in the construction of longitudinal joints. The joint heater will preheat the edge of the previously laid cold lane just prior to placing the new hot mix lane next to it. This approach ensures optimal conditions for a consistent continuous weld of the fresh and previously laid mats, preventing premature cracking of the joint.

The joint heater comprises an aluminum frame with four or six burner heads in stainless steel, and an electronic ignition system that will open the gas flow and ignite the gas in the burners when power is applied to the circuit. The built-in spark plugs will produce sparks continuously during operation to re-ignite on flame blow out. The more burners you have on top of the joint the faster you will get it up to temperature.

Advantages
- Easy to install and operate
- Fits all machines
- Fully serviceable and repairable
- Constant spark ignition system for safe ignition

Strong lightweight aluminum frame
For a rigid frame on extreme heat exposure and low weight for easy handling

Electronic ignition
Electronic ignition opens gas flow and ignites the gas in the burners when the joint heater is plugged in.

Eliminate joint failures for a seamless road by heating up the joint

Options
- 4 Burners
- 6 Burners
- 4 Burner extension for 6 burner

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Eliminate joint failures
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CUSTOMERS IN MORE THAN 70 COUNTRIES ALL OVER THE WORLD