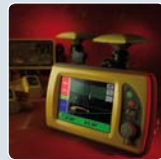
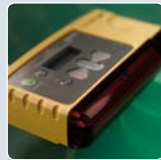
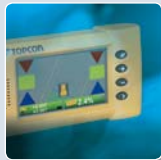


# MACHINE CONTROL CATALOGUE



**YOUR PRODUCTIVITY.  
TECHNOLOGY.**

## Topcon jobsite automation – for a profitable site

Topcon is a worldwide leading manufacturer of positioning and control instruments and continues to set the world standard of precision positioning. Topcon aims at always improving the accuracy, durability and affordability in equipment for machine control and automation in construction.

Topcon’s product portfolio includes a wide variety of everything from optical measuring instruments and rotating lasers to machine control devices and satellite positioning equipment. All Topcon machine control products are scalable and upgradeable.

Regardless of the type of machine you use, Topcon has a machine control product that will reduce the set-up time and down-time significantly. All in order to provide you with modular and seamless state of the art jobsite management solutions that improve the savings, productivity, quality and management on your jobsite significantly.



**Cost reductions** – Less wear and tear on machinery as well as less working hours. Optimization of material usage through high accuracy automatic control and reduction or even elimination of staking and engineering costs.

**Productivity increase** – Nearly continuous production. Doubled, tripled or even quadrupled productivity, and the use of only the required amount of materials.

**Quality increase** – You will be able to work with the highest possible precision. Parameters such as quality and accuracy are equally high on the whole jobsite and the risk of human errors and need to re-work parts of the job is eliminated.

**Site Management** – Knowing where your machines are, planning your fleet maintenance, enabling direct communication between office and machines, monitoring productivity and real time insight of the construction status. You will be able to manage, support and check your entire site directly from your office or mobile.

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This Topcon Machine Control catalogue will guide you through all solutions that we have available for you to improve your business. Solutions for single machines and solutions for your entire job site.

## Overview of technologies used in Topcon Machine Control solutions

**2D Positioning** – The most basic 2D control system uses the reference of a laser or sonic transmitter to set the blade, bucket or screed of your machine. Display indicators show the operator in which direction to move the bucket or blade to get “on-grade”. 2D systems immediately eliminate the need of external grade checkers working around the machine.

**3D Positioning** – With 3D machine control the engineers’ designs are directly loaded on a computer in the cabin of the machine. The system continuously measures its actual position and compares this to the design data. The difference between the two is automatically corrected via the machines’ hydraulics. Different sensors are available, like Total Stations, GPS+ (GPS + GLONASS), mmGPS and 3DMC<sup>2</sup>.

**LPS** – When satellites are not visible, for instance when working in a tunnel or dense build areas, Local Position System (LPS) is the right choice. LPS uses a traditional survey robotic total station to calculate the machines coordinates.





### TECHNOLOGIES





**Millimeter GPS** – The mmGPS system will give you mm accuracy. By setting up a Laser Zone™ transmitter and sensor on the machine, you finish grade with all benefits of GPS+ and the accuracy of a Total Station. mmGPS gives you the flexibility to use multiple machines and survey crews with the same reference at the same site.

**3DMC<sup>2</sup>** – Twice as fast, twice as accurate, 3DMC<sup>2</sup> will drastically change the role your machine plays on a typical site. It will allow you to use it more efficiently. Along with increased speed, 3DMC<sup>2</sup> means fewer passes resulting in much more work done in less time, with less fuel and less machine wear.

**SiteLink3D** – is the first jobsite management system to provide site communication, complete data control, remote support and a reporting system in one. Combine all information across the line for up to date information on the progress of a project. Share it throughout the process, connect your entire fleet.

# Complete jobsite Control with Topcon Machine Control Systems

Every construction jobsite is like operating a manufacturing process, with different steps and phases, all closely related and the next depending on the previous.

The key to optimize the entire flow of activities in this process – to increase productivity and to reduce operating costs – is the automation of positioning and control work on your jobsite.

Topcon offers a complete suite of state-of-the-art solutions to manage your jobsite data and to efficiently run your production process, from automated control systems on your machinery and efficient use of survey data, to integration of survey staking work with actual execution.



## DESIGN – OPERATION – CONTROL



**Design and Positioning standard** – In almost any industry CAD has long been the standard. Even in construction, it is used to create all site and building plans. This holds true from early stage in tendering, bidding and planning to daily operation, grade checking and job site volume calculations.

Where CAD is the standard in design, GPS+ (GPS + GLO-NASS) is the standard in positioning. Nowadays a GPS+ infrastructure is built on the construction site to ensure that all parties have accurate positions.

Topcon offers solutions that are dedicated for every construction phase. Perfect for each phase in the execution process, they also keep the connection to the entire project. Where GNSS or CAD is not available, Topcon instead brings you tailor made solutions.



**3D Indicate GPS+**  
clearing



**3D mmGPS**  
paving



**3D mmGPS**  
finish base material



**3DMC<sup>2</sup> 3D GPS+**  
place base material

Topcon Machine Control Technology solutions overview of Excavator and Dozer Systems

MC SYSTEMS	Excavator	Dozer
2D Laser	●	●
3D GPS+	●	●
3D LPS		●
3D mmGPS		●
3D MC <sup>2</sup>		●

**3D GPS+**

surveying, planning and managing



**3D Indicate GPS+**  
roughing in subgrade



**3D Indicate GPS+**  
excavation and utilities



**3DMC<sup>2</sup>**  
**3D GPS+**  
finish subgrade



**SYSTEMS** ▶



**Project phases** – Each phase of the process has its own character. Clearing, rough grading, excavating, fine grading, finishing and paving – all related to each other even though clearly different types of machines are used. And in spite of having specific needs, technologies and users, the machines work together on one goal: to finish the job as soon and as accurate as possible.

The secret of dedicated solutions with an eye for the whole project is in the flexible usage of the same components on different machines. Topcon machine control systems are built up with the same components, creating exchangeable units that can go from one machine to the other. Besides exchanging are all systems upgradeable back and forth. This is unique and guarantees your investment.

The further the jobsite proceeds, the more valuable the resources and the more accurately the machines need to operate. It is logical to use the existing site positioning infrastructure for the different project phases.

Each phase and machine uses 3D GPS+ positioning. Add mmGPS for accuracy or MC<sup>2</sup> for speed when needed.

Topcon Machine Control Technology solutions overview of Grader and Paver Systems

MC SYSTEMS	Grader	Paver
2D Laser/Sonic	●	●
3D GPS+	●	
3D LPS	●	●
3D mmGPS	●	●
3D MC <sup>2</sup>	●	

## Excavator Control Systems

An excavator is a special machine to control as it is used in excavating work, material overhaul and even fine grading. All moving parts need to be measured, which is done via highly accurate rotation sensors that are mounted on safe places on boom, stick and bucket. Topcon offers both up-gradeable 2D and 3D solutions.

With Topcon's excavator systems you will "get to grade" faster, be more accurate and therefore save time, material and money. This goes especially for jobs such as road construction, landfill slopes, underwater digging and other earth-moving applications. It will not only help the operator in finishing, but also the logistic planning of dump trucks will be more consistent.

All Topcon machine control products are scalable and up-gradeable. On top of this, all construction machinery using Topcon 3D systems are interfaced with the same software. Excavators, dozers, motor graders, wheel loaders, pavers and even survey crews – all work with the same user-friendly software.



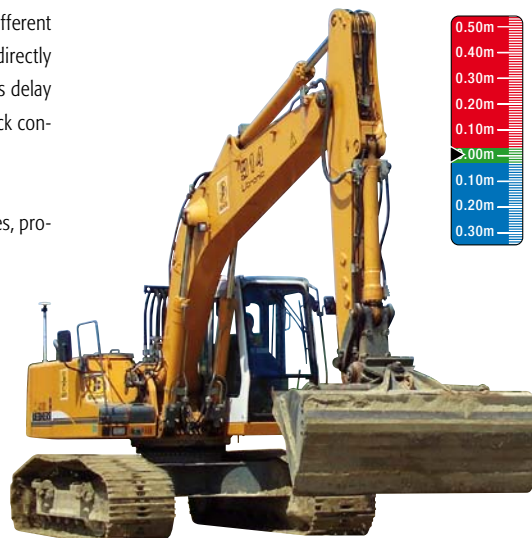
GPS+ APPLICATION		2D Laser	3D GNSS
Infrastructure	Road	●	●
	Rail	●	●
	Airport	●	●
Site	Parking lot	●	●
	Refuse dump	○	●
Landscaping	Golf course	○	●

## BUCKET CONTROL SYSTEMS



**2D** With Topcon 2D indicate systems different profiles and slopes can be entered directly into the cabins display. This eliminates delay as well as the frustration of constantly having to check control points or wait for a grade checker.

With additional tilt bucket sensor and compass, slopes, profiles and flat surfaces can be excavated fast and accurate in any bucket or excavator position. You can choose from several references, such as an existing surface, a previous cut, stakes or a rotating laser.



**3D** Topcon 3D Excavator system combines the advantages of our industry-leading GPS+ (GPS + GLONASS) technology together with our industry standard operator interface. With the display, the final grade and current bucket position, is clearly visible.

The cut/fill indicator clearly guides the operator to grade with a graphical colour indicator.



**DOZER SYSTEMS** ▶



**Network Ready** – When a GPS+ reference network or TopNET *live* service is available, the machine receiver is able to pick up the correction signals up using GSM and N-Trip. Via this way a base station is eliminated and the excavator system is even more flexible.



## Dozer Control Systems

Your dozer appears in the process where mass material needs to be spread; usually at sub-base level. To automate dozers, Topcon offers both 2D and 3D solutions. With these systems, you will eliminate over-cutting and keep control over material usage, saving you time and money. With a dozer control system the operator is really in control.

With Topcon dozer systems you will dramatically increase the jobsite's productivity. Especially in accurate dozer spreading they might eliminate the need for motor graders in the next phase and therefore shorten the earth moving train.

All dozer control systems are part of a modular system. And all Topcon machine control solutions are upgradeable back and forth. On top of this, all construction machinery using 3D systems are interfaced with the same software.



APPLICATION		2D Laser	3D LPS	3D GNSS	3D mmGPS	3DMC <sup>2</sup>
Infrastructure	Road	●	●	●	●	●
	Rail	●	●	●	●	●
	Airport	●	●	●	●	●
Site	Parking lot	●	●	●	●	●
	Refuse dump	●	●	●	●	●
Landscaping	Golf course	●	●	●	●	●

## BLADE CONTROL SYSTEMS



Z-52: 2D Laser System



i-33: 3D Indicate GPS+ System



Z-63: 3D mmGPS System

**2D** Topcon's 2D dozer laser system represents a giant leap in dozer grade control. The laser control system includes a 100% slope sensor to measure the blade's slope, in case one laser receiver is used. When using two masts and two laser receivers the slope sensor is not needed. The control box presents the desired slope and elevation to the operator and sends corrections directly to the machine's hydraulics.

2D gives you the flexibility to use reference to work from: existing surface, a point, a previous cut, a predefined slope or a rotating laser. It's as simple as switching on a laser.



**3D** Topcon's 3D control features GPS+ dual constellation. It includes a 100% slope sensor to measure the blade's slope, in case one receiver is used. Ideal for long runs and smooth turns.

With two masts and two GPS+ receivers the slope sensor is not needed and you will get control over fast forward and backward movements as well as short curves.





3D mmGPS control can be used in case millimeter accuracy is required, featuring Topcon's unique Lazer Zone™ technology. By setting up the Lazer Zone™ transmitter and sensor on your dozer, you will increase the accuracy of the GPS+ elevation to millimeter level and finish grade with all the benefits of GPS+ flexibility and the accuracy of a Total Station.




**GRADER SYSTEMS** ▶



Z-63: 3D MC<sup>2</sup> System

DOZER SYSTEM MAIN COMPONENTS				
2D Laser	3D LPS	3D GPS+	3D mmGPS	3DMC <sup>2</sup>
Laser receiver	Prism 360°	GPS+ antenna	GPS+ antenna plus	GPS+ antenna
	Radio	Radio	Radio	Radio
	MC-R3 receiver	MC-R3 receiver	MC-R3 receiver	MC-R3 receiver
Control box	Graphical display	Graphical display	Graphical display	Graphical display
Automatic switch	Automatic switch	Automatic switch	Automatic switch	Automatic switch
Hydraulic valve	Hydraulic valve	Hydraulic valve	Hydraulic valve	Hydraulic valve
	Slope sensor	Slope sensor	Slope sensor	Inertial sensor
Laser transmitter	Total station	Base station or TopNET live	Base station or TopNET live	Base station or TopNET live

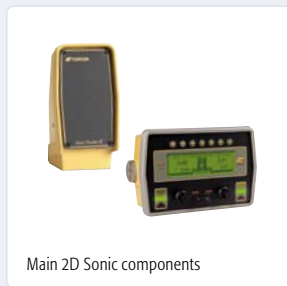
 Increase dozer fine grading speed by up to 200% over existing 3D systems and up to 400% over uncontrolled machines! 3DMC<sup>2</sup> provides position updates at a rate of 100 times per second. Smoothness and grading accuracy are comparable to motor graders.

## Motor Grader Control Systems

The motor grader's purpose is to finish grade of the rough grading carried out by heavy equipment as scrapers and bulldozers. To automate motor graders, Topcon offers both 2D and 3D solutions. With these systems, you will finish off the sub-base and prepare your site for the final phase in the most accurate way.

With motor grader systems you will increase the jobsite's productivity, especially when stakes or stringlines are eliminated. 3D design models replace the stakes and stringlines into a digital form and create an optimum flow between the motor grader and other machines.

All Topcon motor grader control solutions are upgradeable back and forth, using the same slope, rotation and mainfall sensors. Investing in a Topcon motor grader system guarantees years of control.



Main 2D Sonic components

APPLICATION	2D Laser/Sonic	3D LPS	3D GNSS	3D mmGPS	3D MC <sup>2</sup>
Infrastructure					
Dirtroad	●	●	●	●	●
Road	●	●	●	●	●
Highway	●	●	●	●	●
Rail	●	●	●	●	●
Airport	●	●	●	●	●

## BLADE CONTROL SYSTEMS



G-52: 2D Laser System



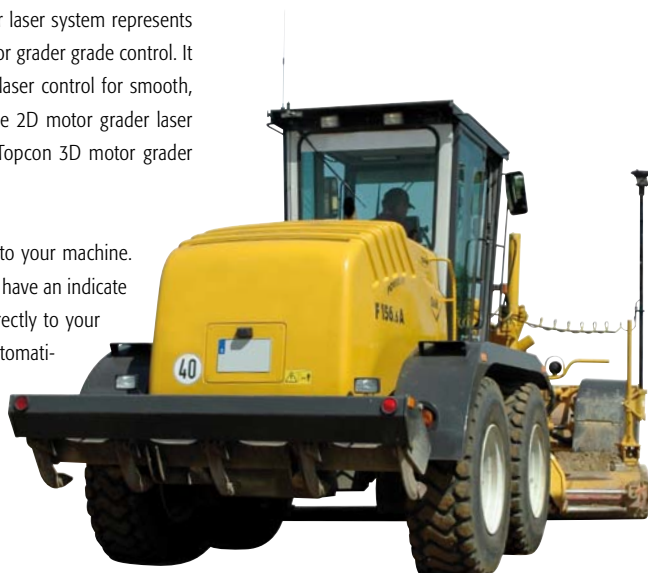
G-63: 3D Total Station System



G-63: 3D GPS+ System

**2D** Topcon's 2D grader laser system represents a giant leap in motor grader grade control. It features System V laser control for smooth, consistent hydraulic response. The 2D motor grader laser is also fully upgradeable to any Topcon 3D motor grader system.

You can also add a sonic tracker to your machine. With the arrow indicators you will have an indicate system. When connecting this directly to your control box and hydraulics you automatically control the motor grader's blade. Imagine the finishing speed this will give you!



**3D** Adding 3D position and elevation to the blades' slope enables finishing complex 3D models and road alignments in no time.

The 3D LPS control forms the most flexible solution for complete automatic motor grader control and advanced robotic survey. The position and millimeter elevation is constantly sent to the machine's control box via high speed radio link.

Topcon's 3D GPS+ control provides you with a 3D position at any time at any place. The software is intuitive and the hydraulic response smooth and consistent.



3D mmGPS control is used in case millimeter accuracy is required. By setting up the Lazer Zone™ transmitter and sensor on the machine, you will increase the accuracy of the GPS+ elevation to laser level and finish grade with all the benefits of GPS+ flexibility and the accuracy of a Total Station.



**PAVER SYSTEMS** ▶



G-63: 3D mmGPS System

**GRADER SYSTEM MAIN COMPONENTS**

2D Sonic	2D Laser	3D LPS	3D GPS+	3D MC <sup>2</sup>	3D mmGPS
Sonic tracker	Laser receiver	Prism 360° Radio	GPS+ antenna Radio	GPS+ antenna Radio	mmGPS receiver Radio
Mainfall	Mainfall	Mainfall MC-R3 receiver	Mainfall MC-R3 receiver	Mainfall MC-R3 receiver	Mainfall MC-R3 receiver
2D Control box	2D Control box	Graphical display	Graphical display	Graphical display	Graphical display
Automatic switch	Automatic switch	Automatic switch	Automatic switch	Automatic switch	Automatic switch
Hydraulic valve	Hydraulic valve	Hydraulic valve	Hydraulic valve	Hydraulic valve	Hydraulic valve
Slope sensor	Slope sensor	Slope sensor	Slope sensor	Inertial sensor	Slope sensor
Rotation sensor	Rotation sensor	Rotation sensor	Rotation sensor	Rotation sensor	Rotation sensor
String line or other reference	Laser Transmitter	Total Station	Base station or TopNET live	Base station or TopNET live	Base station or TopNET live

## Paver Control Systems

Spreading material with a paver in the last phase is different from spreading material in earlier stages, as material and mistakes are extremely expensive. Therefore it is critical to have the right system to achieve the job.

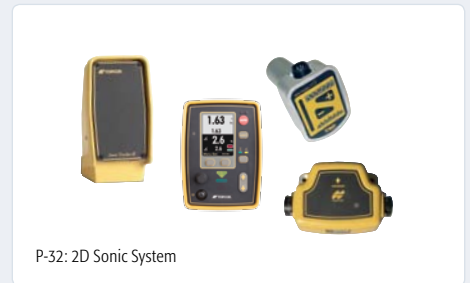
Your paver and paving job dictates which system offers you the most. Topcon's 3D paving solutions are developed to assist with complex designs, where 2D paving solutions assist for smaller sites .

Especially using 3D mmGPS the benefit is very clear. Eliminating string lines, decreasing the dismantling of road barriers, simplifying truck logistics, increasing paving accuracy and simply getting it right at the first time are all direct effects of automating your paver.



APPLICATION		2D Laser	2D Sonic	3D LPS	3D mmGPS
Infrastructure	Road	●	●	●	●
	Rail	●	●	●	●
	Airport	●	●	●	●
Site	Parking lot	●	●	●	●
	Sportfield	●	●	●	●

## SCREED CONTROL SYSTEMS



Topcon's 2D paver laser system represents the first step in automating your paver. It features System V laser control for smooth, consistent hydraulic response. The 2D paver laser is also fully upgradeable to any Topcon 3D paver system.

Besides a laser you can also add a sonic tracker to your machine. With the arrow indicators it is an indicate system.

When connecting this directly to your control box and hydraulics you automatically control the paver's screed. Imagine the finishing speed this will give you!





**LPS**

**3D-LPS Paver control system** – A standard survey Total Station measures continuously the position of the screed and sends this over to the operator’s control box. This robotic Total Station has been the standard for surveys, and this proven technology is now used for machine control. So LPS forms the most flexible solution for complete automated paver control and advanced robotic surveys with the highest precision.



P-63: 3D LPS System

**SOFTWARE AND MORE** ▶



P-63: 3D mmGPS System

**MILLIMETER GPS**

**Highest precision with mmGPS** – Topcon’s industry-leading mmGPS precise positioning technology has been expanded into the paving industry, creating the world’s first 3D-GPS control system for pavers, profilers and trimmers.

Topcon’s unique technology provides a significant enhancement in the vertical precision of GPS. The technology, known as Laser Zone™, is used by hundreds of companies worldwide to generate a vertical accuracy to within a few millimeters as compared to the centimeter vertical accuracy of conventional RTK GPS.

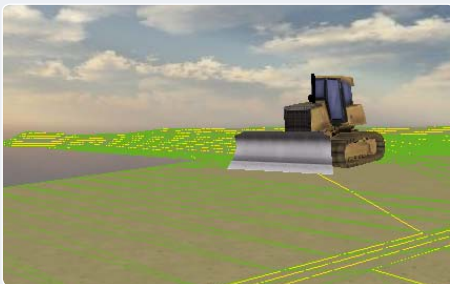
Utilized on pavers, the Millimeter GPS technology incorporates a unique zone-beam laser transmitter, which sweeps a 600m area with a 10m high wall of laser light. A compact sensor is mounted on a mast which is attached to the toe arm of the paver. Any time the MC sensor is positioned within the laser zone signal, the system provides millimeter vertical precision.

# The ultimate job site management tool

**siteLink3D** connects all parts of a construction site together – people, data, devices, machines – no matter where they are. It's the one system that provides construction companies with a way to manage their projects and resources effectively. It provides communication, management and collaboration tools that shows real-time site status and improves planning.

**What drives the system?** - At the heart of the system is the Enterprise cloud server that manages data and services. Data and services are securely separated by customer organization and through comprehensive user-access controls. SiteLink3D provides reliable and secure connections through communication networks with guaranteed quality of service.

As well as data synchronization and distribution, the SiteLink3D enterprise solution provides powerful site analytics functions. SiteLink3D constantly measures site progress through volumetric monitoring and can provide real-time and ad-hoc volume analysis reports.



## SITE MANAGEMENT



The idea stemmed from the need to conveniently exchange data between the office and machines, and onsite construction workers, surveyors and the office. The mining industry was an early market adopter more for the sake of safety rather than convenience. This still applies. Beyond straight-forward data exchange came the opportunity to monitor and measure machine operations and performance and productivity especially in the mining sector. With the availability of high-speed cellular networks almost everywhere,

the construction sector now too can enjoy the convenience of remote data management and the cost and time-saving benefits of quantified site metrics.

**Real-time overview** - The smart thing of SiteLink3D is that it tracks the real-time as-built surface, the only system that has this feature. The system keeps a real-time update of the current state of the job site and the surface. It can track surface volumes and can exactly calculate how

much dirt already is moved and how much more there is to move and presents this to those that need it; site manager, surveyor and operator. It also provides data on progress, performance and productivity. Out of this data the project manager can adjust job site schedules and make changes that can be directly distributed to the machines from any location. And, by using the productivity element of SiteLink3D, you can analyze the site's progress and you will actually visualize specific areas where time was lost.

**Site communication** - Every person connected with SiteLink3D is able to communicate and collaborate remotely, no matter where they are.

Fewer people will need to waste time driving around the job site, stopping the work to update information as sending files and communicating with the work crews is done directly on the control box or field computer. It increases

visibility and transparency and eliminates problems related to remote job sites.

**Cloud data** - SiteLink3D uses a seamless cloud model for data warehousing and distribution. Data servers and web portals are deployed geographically based on user demand across all continents. By separating data and web services,

SiteLink3D sets the benchmark for job site communications and project data management and provides an open architecture for contractors, sub-contractors, surveyors, engineers, OEMs and third-party participants in projects to share data and services.



SITE MANAGEMENT



Comparing SiteLink3D to anything in today's mushroom cloud of technology is like a combination of Mail Service, chat, Messaging, Screen Sharing, Task Management and Scheduling.

SiteLink3D: It's the link that combines the best out of all those into one product that has unlimited applications on every job sites.



## About Us

With over 80 years worth of experience in the manufacture, distribution and support of products, Topcon is well placed to offer comprehensive support to cater for all your needs.

Established in 1932, Topcon today is represented by a workforce of over 6,000. Topcon develops, manufactures, sells, and provides services for a wide range of high technology products for the capture, analysis and presentation of spatial data in the macro, micro and nano worlds.



Investment in research and development leading to innovative new solutions and products is key to the Topcon philosophy and is evident in a number of industry firsts that include the first coaxial EDM Total Stations, the GTS-1 and the unique GPT-7000i series imaging Total Stations incorporating digital cameras.

Additionally, Topcon has produced the first and only available mmGPS system, and is the first to offer a true GNSS (Global Navigation Satellite System); dual frequency, dual constellation, GPS plus GLONASS satellite receivers.

Topcon developed inertial sensors to further improve stability with fast blade movements on dozers and motor graders.

Recently Topcon introduced cloud-based management for survey and construction.



[www.topcon.eu](http://www.topcon.eu)

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