Thermo Scientific TraceGOLD
Fast GC Columns

Increase speed of analysis
Without compromise

You want to increase the speed of your analysis, but you don't want to impact the chromatographic performance. TraceGOLD Fast GC Columns are designed for you.

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Thermo Scientific TRACE 1300 series gas chromatograph

Increasing productivity is the primary challenge for laboratories using automated analytical equipment. Improvements in these areas are directly connected with the simplification of analytical workflow, optimization of technical resources and waste reduction.

Thermo Scientific™ TRACE 1300™ Series Gas Chromatograph is the latest technology to simplify workflow and increase analytical performance in QA/QC and routine laboratories. Developed around key innovations driven by customer needs, TRACE 1300 Series GC delivers:

- The capability to quickly tailor to specific user requirements
- Easy adoption of standard GC methods
- Unmatched detector sensitivity in trace analysis
- Increased robustness of injector technology
- Shorter sample cycle time

TraceGOLD
Fast GC Columns

GC chemists are continually striving to reduce analysis times to increase sample throughput. TraceGOLD Fast GC Columns are shorter, smaller ID columns than conventional GC columns. This means that analysis times can be reduced.

Faster analysis with the same separation

Analysis times can be decreased by using the following:
- Shorter columns
- Quicker oven temperature ramp rate
- Higher carrier gas linear velocity

These changes also decrease resolution – however, this can be offset by the following:
- Narrow ID columns
- Hydrogen as a carrier gas
- Small film thickness

When decreasing column length and ID, it is important to maintain the phase ratio between your conventional column and Fast GC column. Using the table below will help to ensure the correct dimensions of column are selected:

Phase Ratio

Phase Ratio is the ratio of the volume of mobile phase to the stationary phase. It is an important value when changing the column dimensions in a method:

Phase Ratio (β) = column ID (µm) / 4 × film thickness (µm)

Column diameter, dc (mm)	Film thickness, df (µm)										
	0.15	0.18	0.25	0.5	1	1.4	1.5	1.8	2.65	3	5
0.15	250	208	150	75	38	27	25	21	14	13	8
0.18	300	250	180	90	45	32	30	25	17	15	9
0.25	417	347	250	125	63	45	42	35	24	21	13
0.32	533	444	320	160	80	57	53	44	30	27	16
0.53	883	736	530	265	133	95	88	74	50	44	27

A 0.25 mm × 0.25 µm GC column has the same phase ratio as a 0.15 mm × 0.15 µm column, so will show the same selectivity provided the column stationary phase is kept the same. However, the efficiency on the 0.15 mm ID column will be greater, allowing for a similar separation to be performed with a shorter column length.

The performance of a 30 m × 0.25 mm × 0.25 µm column can therefore be achieved with a 20 m × 0.15 mm × 0.15 µm column in up to 30% less time.

Faster analysis with the same separation

Selection of the most appropriate TraceGOLD Fast GC Column will ensure that column performance and separation is maintained while decreasing analysis time.

Benefits of faster analysis:

- Increase speed of analysis by a factor of 3-10 times
- Faster method development
- Reduction in analysis costs
- Run any application with no compromise in the quality of results

Easy optimization of conventional methods

TraceGOLD Fast GC can be applied to any application in any industry. Conventional GC methods can easily be transferred to Fast GC columns without compromising performance, through consideration of the following parameters:

- Column length
- Column ID
- Column film thickness
- Carrier gas linear velocity

A reduction in column length will increase speed of analysis, but will lead to a decrease in resolution. This decrease can be offset by a decrease in column ID.

The table below shows approximate column dimensions that can be replaced in order to achieve faster GC analysis. The ratio of column length to ID and phase ratio are kept the same, provided the carrier gas flow rate and fast oven ramp rate are adjusted to give similar performance

Present Column	Fast GC Column
15 m × 0.25 mm × 0.25 μm	10 m × 0.15 mm × 0.15 μm
30 m × 0.25 mm × 0.25 μm	20 m × 0.15 mm × 0.15 μm
60 m × 0.25 mm × 0.25 μm	40 m × 0.15 mm × 0.15 μm
15 m × 0.32 mm × 0.25 μm	10 m × 0.15 mm × 0.15 μm
30 m × 0.32 mm × 0.25 μm	15 m × 0.15 mm × 0.15 μm
60 m × 0.32 mm × 0.25 μm	30 m × 0.15 mm × 0.15 μm

Fast Analysis of Florida TRPH C8-C40 Standard using TraceGOLD TG-1MS
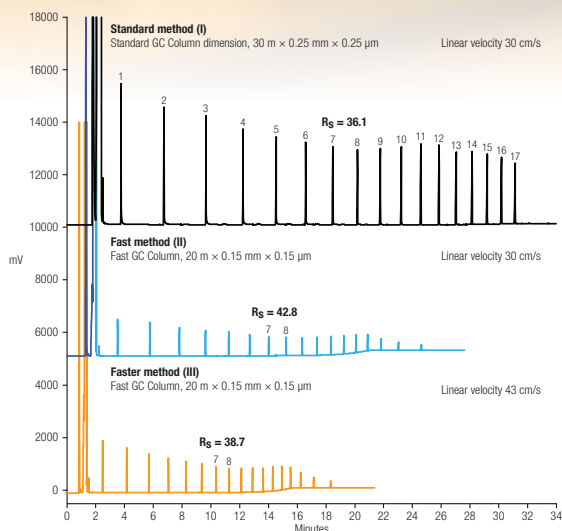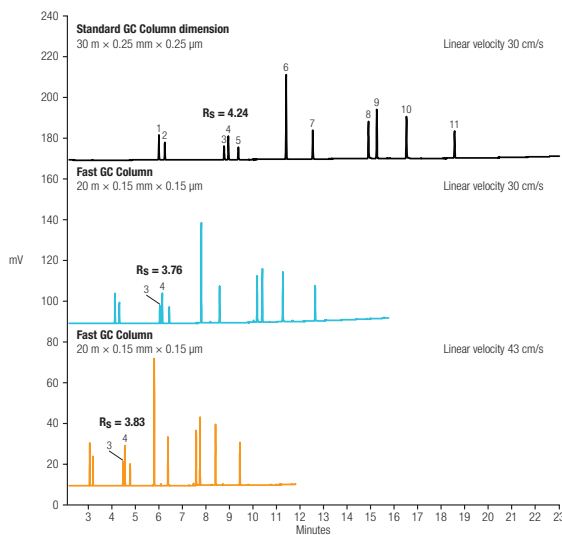

The analysis time decreased by 15% on the Fast GC column (II) compared with the standard column (I) with a small increase in resolution of approximately 3%. Method (II) was then further modified by increasing the linear velocity by approximately 40-50% to give the faster method (III). The analysis time was reduced by approximately 50% of the original method (I) with a small loss in resolution of about 4.5%.

Fast Analysis of Organochlorine Pesticides using TraceGOLD TG-5SilMS
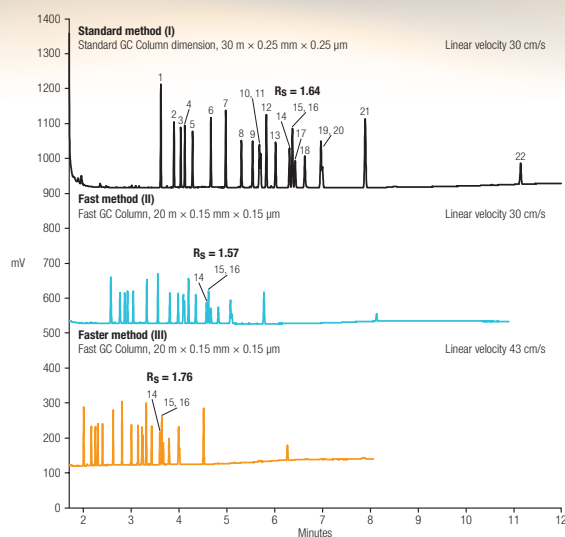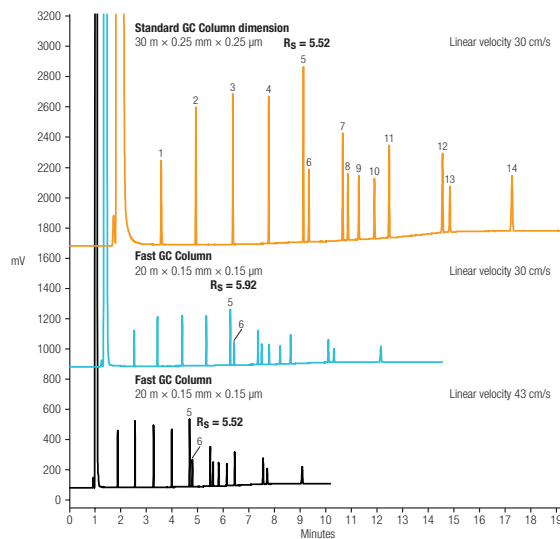

The analysis time decreased by 30% on the Fast GC column (II) compared with the standard column (I) with a minimal reduction in resolution of approximately 4%. Method (II) was then further modified by increasing the linear velocity by approximately 40-50% to give the faster method (III). The analysis time was reduced by approximately 50% of the original method (I) with a slight increase in resolution of about 7%.

Fast Analysis of Phenols using TraceGOLD TG-5MS

The analysis time decreased by 30% on the Fast GC column (II) compared with the standard column (I) with a reduction in resolution of approximately 11%. Method (II) was then further modified by increasing the linear velocity by approximately 40-50% to give the faster method (III). The analysis time was reduced by approximately 50% of the original method (I) with an decrease in resolution of about 10%.

Fast Analysis of FAMEs using TraceGOLD TG-WaxMS

The analysis time decreased by 30% on the Fast GC column (II) compared with the standard column (I) with an increase in resolution of approximately 7%. Method (II) was then further modified by increasing the linear velocity by approximately 40-50% to give the faster method (III). The analysis time was reduced by approximately 50% of the original method (I) with no change in resolution.

Method transfer in Fast GC

The following calculations can be used to determine the system parameters required to optimise performance using a TraceGOLD Fast GC column

$$t_{g2} = t_{g1} \; \frac{v_2}{v_1} \frac{\beta_2}{\beta_1} \frac{l_1}{l_2} \qquad T_2 = T_1 \; \frac{v_1}{v_2} \frac{\beta_1}{\beta_2} \frac{l_2}{l_1}$$

Where;

t_{g1}, t_{g2} - temperature gradient for original and new conditions

v_1, v_2 - linear velocity of gas for original and new conditions

T_1, T_2 - Hold time for isothermal part of separation for original and new conditions

β_1, β_2 - Phase ratio for original and new conditions

l_1, l_2 - length of column for original and new conditions

Ordering Information

TraceGOLD Fast GC Columnn	Phase Dimensions	Part Number
TG-1MS	10 m × 0.15 mm × 0.15 µm	26099-2750
TG-1MS	20 m × 0.15 mm × 0.15 µm	26099-2760
TG-1MS	40 m × 0.15 mm × 0.15 µm	26099-2940
TG-1MS	20 m × 0.18 mm × 0.18 µm	26099-5780
TG-5MS	10 m × 0.15 mm × 0.15 µm	26098-2750
TG-5MS	20 m × 0.15 mm × 0.15 µm	26098-2760
TG-5MS	40 m × 0.15 mm × 0.15 µm	26098-2940
TG-5MS	20 m × 0.18 mm × 0.18 µm	26098-5780
TG-5SilMS	10 m × 0.15 mm × 0.15 µm	26096-2750
TG-5SilMS	20 m × 0.15 mm × 0.15 µm	26096-2760
TG-5SilMS	40 m × 0.15 mm × 0.15 µm	26096-2940
TG-5SilMS	20 m × 0.18 mm × 0.18 µm	26096-5780
TG-WaxMS	10 m × 0.15 mm × 0.15 µm	26088-2750
TG-WaxMS	20 m × 0.15 mm × 0.15 µm	26088-2760
TG-WaxMS	40 m × 0.15 mm × 0.15 µm	26088-2940
TG-WaxMS	20 m × 0.18 mm × 0.18 µm	26088-5780
TG-200MS	10 m × 0.15 mm × 0.15 µm	26084-2750
TG-200MS	20 m × 0.15 mm × 0.15 µm	26084-2760
TG-17SilMS	10 m × 0.15 mm × 0.15 µm	26072-2750
TG-17SilMS	20 m × 0.15 mm × 0.15 µm	26072-2760

Resources
for Chromatographers

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For more information visit: **www.thermoscientific.com/columnsforgc**

USA and Canada +1 800 332 3331
France +33 (0)1 60 92 48 34
Germany +49 (0) 2423 9431 20 or 21
United Kingdom +44 (0)1928 534110
Japan +81 3 5826 1615

China +86 21 68654588 +86 10 84193588
+86 20 83145199   800 810 5118
India +91 22 6742 9494 +91 27 1766 2352
Australia 1 300 735 292 (free call domestic)
New Zealand 0800 933 966 (free call domestic)
All Other Enquiries +44 (0) 1928 534 050

Technical Support
North America +1 800 332 3331
Outside North America +44 (0) 1928 534 440

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BR20699_E 12/12S