

Sophisticated Life Science Research Instrumentation



TSE Rotameter System

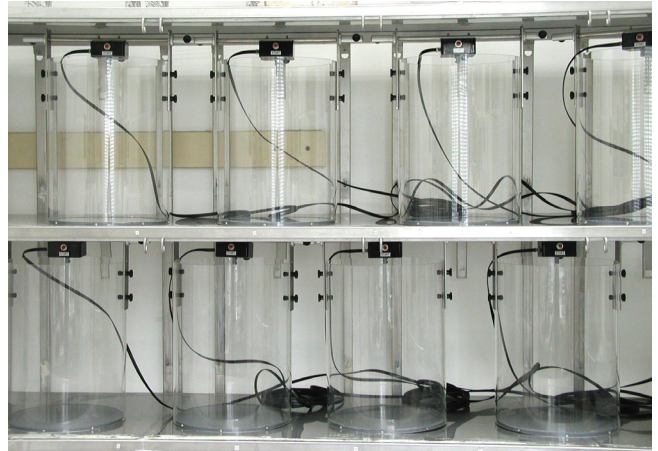
Rotometry monitor for small laboratory animals

– Specifications subject to change without notice –

TSE Rotameter System

Features

- For simultaneous operation of up to 32 rotameter units
- All measuring units can be used independently from one another
- The *remote start switch* allows to start the experiment immediately after the animal has been placed into the test cage
- The system is operated via USB port for easy connection to the system PC or notebook

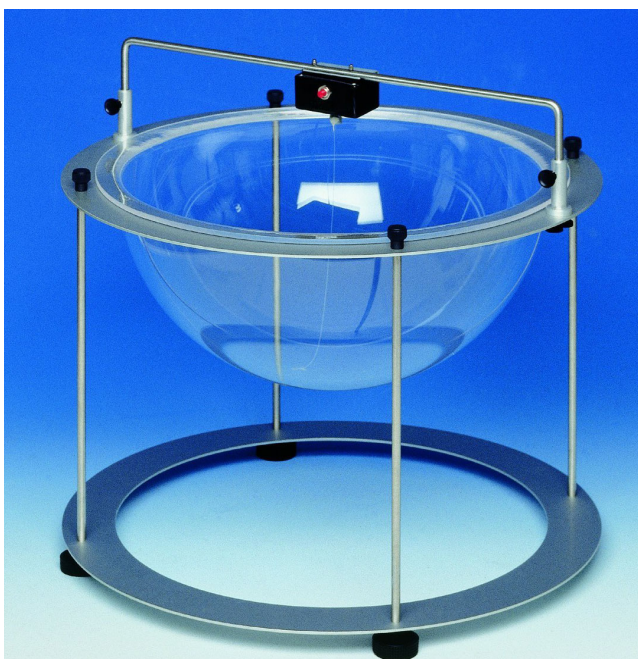


Multi-place system with cylinder cages

System description

The TSE Rotameter System is a flexible computer-controlled rotometry monitor for small laboratory animals designed to analyze rotational behavior, e.g. induced by unilateral brain lesions in pharmacological studies.

The animal that moves about in a special arena is tethered to a rotary sensor. The low-torque construction ensures that the animal's movement is not restricted in any way. This sensor monitors clockwise and counter-clockwise rotations and records changes of directions.



Rat unit (bowl test cage)

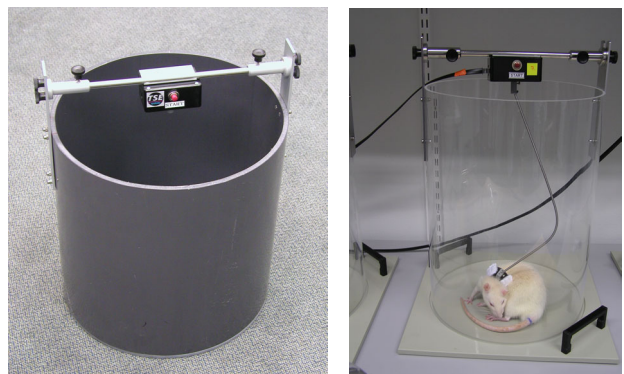
Standard components

The system is available for rats and mice and consists of the following components:

- Up to 32 rotameter units,
- one rotary sensor for each rotameter with remote start switch,
- animal harness ("jacket"),
- tether,
- a process control unit with USB connector and
- the TSE Rotameter software for Windows (2000/XP)

Rotameter units

In the standard version the rotameter units are designed as open bowl cages made from clear plastic to allow optimum visibility.



Rat units (cylindrical cages)

Bowl Dimensions

Diameter 500mm
Depth 250mm

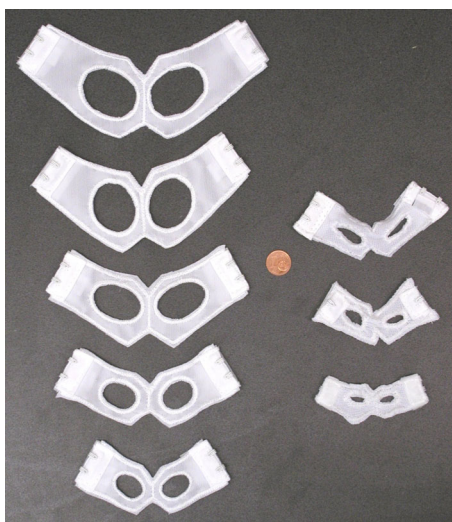
The sturdy metal base can be easily dismantled for cleaning purposes.

We also manufacture cylindrical cages made from grey PVC or clear perspex.

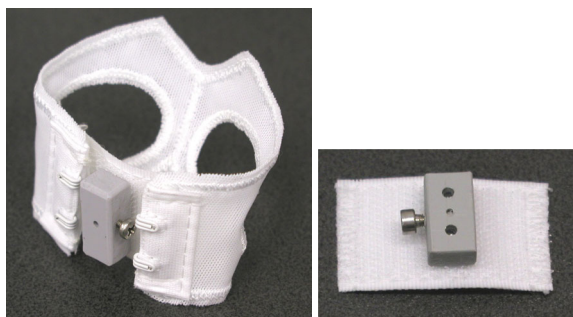
Cylinder Dimensions

Diameter 340mm
Depth 350mm

The animal harness ("jacket")



Animal Jacket sizes for rats (left) and mice (right)
- The coin has a diameter of 16mm -



An animal jacket is used to connect the tether to the animal. Different sizes are available depending on animal species and weight.

The rotary sensors



Each rotameter is equipped with a special rotary sensor that is mounted to a u-shaped bracket. It records the direction and number of rotations.

The resolution is 1/250 turn (250 increments for one full rotation = 1.44°). These sensors are connected to the process control unit.

Process control unit / PC / interface

The process control unit contains the electronics for recording the rotations. It is connected to both the rotary sensors of the rotameter units and to the PC. The connection to the PC or notebook is made via a USB connector (USB 2.0 required).

Rotameter software

The comfortable Rotameter software that controls the experimental procedure and collects the animal rotations is very easy to learn and use. It currently runs under the operating systems Windows 2000 and XP.

Working with the system is performed according to the following pattern:

- preparing the setup for an experiment
- running the experiment, and
- analyzing the collected data

If your experiment requires software features other than those mentioned below please ask for adaptation to your specific needs.

Preparing for the experiment

Before the start of the experiment all the data which describe the laboratory animal and the experiment are defined by the operator.

Box	Enable	Animal No	Weight [g]	Text1	Text2	Text3
1	YES	1001	300	Text01-1	Text02-1	Text03-1
2	YES	1002	300	Text01-2	Text02-2	Text03-2
3	YES	1003	300	Text01-3	Text02-3	Text03-3
4	NO	0	0			
5	NO	0	0			

Control parameters influence the course of the experiment.

Sensor resolution Steps

Increment CW / CCW Counters at 360,00°

Detect direction change at 36,00°

Scan Start Buttons

Add Sum Line (Format 2)

Add Diff CW-CCW Line (Format 2)

Write binary file

Interval [ms]

A filter can be used for recording changes of direction; an appropriate value can be selected for this filter. A change in direction will only be registered when the animal has covered the corresponding distance in the opposite direction.

If required the

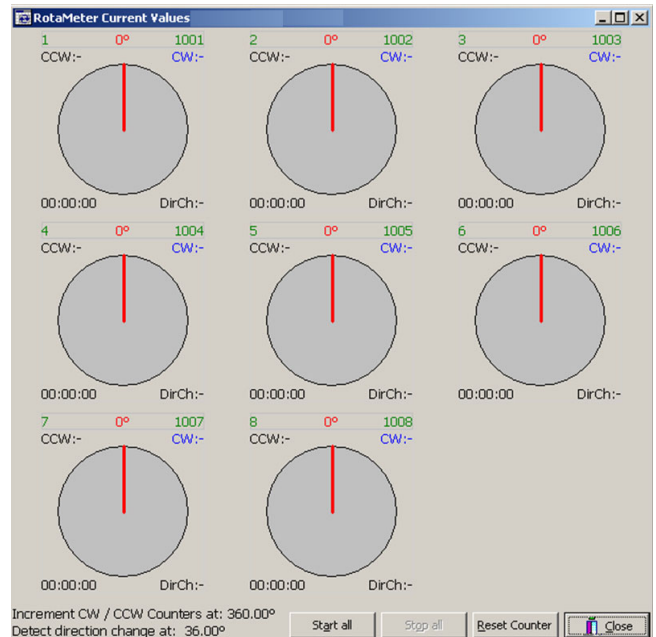
- total number of counts (CW and CCW separately) and the
- difference CW – CCW

for each box can be output in the export file.

If **Write binary file** has been activated then at the interval entered under it (in milliseconds) the angle setting of the sensors will be recorded and saved in a bin-file. This file can be exported.

Staggered Start

After definition of all parameters the experiment can be started immediately for an individual rotameter. The animal is placed in the rotameter and the box symbol in the software is double-clicked. Alternatively the remote start switch on the sensor can be pressed in order to start data acquisition as soon as the animal has been placed into the cage.



Data recording now starts for this rotameter. All required units can be started independent of one another in this way allowing a single user to handle a large number of units.

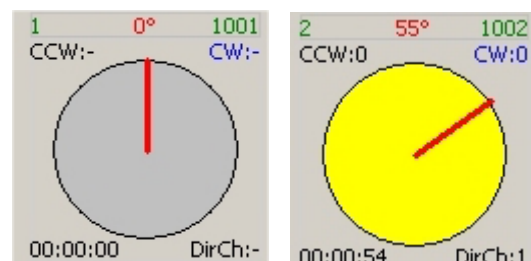
Simultaneous Start

Alternatively the experiment can be started simultaneously for all rotameters by pressing the *Start all* button.

The running trial

During execution of the experiment a schematic overview of the rotameters is displayed in the so-called trial monitor.

The color of a rotameter indicates its current status:



- grey rotameters have not yet been started for an experiment
- yellow rotameters have been started for an experiment

When a rotameter has been started a pointer ("radius") which moves synchronously with the rotation of the sensor allows the experiment to be checked continuously.

In addition the following information is displayed:

- box number
- animal number
- number of counterclockwise rotations (seen from above)
- number of clockwise rotations (seen from above)
- elapsed experiment time
- number of changes of direction

The values for CW and CCW are set to zero after each measuring interval. Each unit has its own clock and is independent of the other units.

While the experiment is being carried out so-called event markers can be set in order to document particular events. The event markers appear in the evaluation table and in the export file.

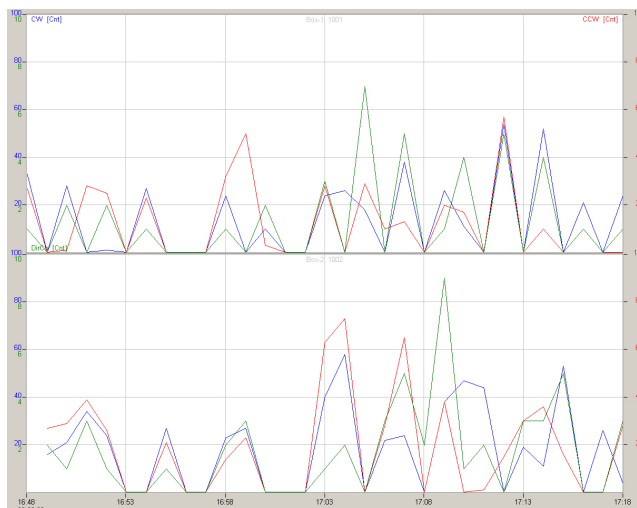
Event markers can be defined before the start of the experiment and while the experiment is being carried out.

End experiment

In normal cases the experiment in a specific rotameter will be stopped automatically when the preset time has elapsed. The experiments can also be terminated *manually* in all active boxes.

Evaluating the measuring data

In the run graph the rotation events are shown graphically. Both directions of rotation as well as the number of changes of direction appear as separate curves in a coordinate system with time (in minutes) as the X-axis and number of rotations / changes as the Y-axis.



Measurement analysis is enabled using different evaluation tools, for example:

- mean values
- median values
- sum values

...with respect to time or to all animals within the experiment

User-specific group definition and analysis is also possible.

Data export

For further statistical calculations in special statistics packages or spread sheet programs (e.g. SAS or Excel) the raw data tables and the analysis tables can be stored in ASCII compatible export files (CSV-format).

Test 04	Exp001	TX001	TX002	TX003		
Box	Weight	Animal No.	Text1	Text2	Text3	
1	0,3	1001	Text01-1	Text02-1	Text03-1	
2	0,3	1002	Text01-2	Text02-2	Text03-2	
3	0,3	1003	Text01-3	Text02-3	Text03-3	
Date	Time	Animal No.	Box	CW [Cnt]	CCW [Cnt]	DirCh [Cnt]
24.03.2006	14:23	1001	1	10	9	14
24.03.2006	14:24	1001	1	12	2	5
24.03.2006	14:25	1001	1	3	10	6
24.03.2006	14:26	1001	1	0	7	5
24.03.2006	14:27	1001	1	1	2	2
24.03.2006	14:28	1001	1	11	2	7
24.03.2006	14:23	1002	2	6	8	12
24.03.2006	14:24	1002	2	11	0	1

If required the

- total number of counts (CW and CCW separately) and
- the difference CW – CCW

for each box can be output in the export file.

Partial list of users

- Bayer Schering Pharma AG, Berlin, Germany
- Boehringer Ingelheim Pharma GmbH & Co. KG, Biberach, Germany
- Buck Institute for Age Research, Novato, CA, USA
- Capital University of Medical Science, Beijing, China
- Cerebricon Ltd., Kuopio, Finland
- Charité - Universitätsmedizin Berlin, Berlin, Germany
- D-PHARM. Ltd., Rehovot, Israel
- Eisai London Research Laboratories Limited, London, Great Britain
- F. Hoffmann-La Roche AG, Basel, Switzerland
- Friedrich-Schiller-Universität Jena, Jena, Germany
- Georg-August-Universität Göttingen, Göttingen, Germany
- King's College London, London, Great Britain
- Ludwig-Maximilians-Universität München, Planegg-Martinsried, Germany
- Max-Planck-Institut für Psychiatrie, München, Germany
- Merck KGaA, Darmstadt, Germany
- Merz Pharmaceuticals GmbH, Frankfurt, Germany
- National University of Singapore, Singapore, Singapore
- NOVARTIS PHARMA AG, Basel, Switzerland
- Pfizer Global Research & Development – PGRD, San Diego, CA, USA
- Philipps-Universität Marburg, Marburg, Germany
- ReNeuron, Guildford, Surrey, Great Britain
- Rijksuniversiteit Groningen, Groningen, The Netherlands
- Ruprechts-Karls-Universität Heidelberg, Heidelberg, Germany
- Solvay Pharmaceuticals B.V., Weesp, The Netherlands
- Targacept, Inc., Winston-Salem, NC, USA
- Universite de Marseille, Marseille Cedex, France
- Universite de Provence, Marseille Cedex, France
- University of Cincinnati, Cincinnati, OH, USA
- University of Helsinki, Helsinki, Finland
- University of Ioannina, Ioannina, Greece
- University of Tartu, Tartu, Estland

References

- **Valastro B, Dekundy A, Krogh M, Lundblad M, James P, Danysz W, Quack G, Cenci MA.** Proteomic analysis of striatal proteins in the rat model of L-DOPA-induced dyskinesia. *Journal of Neurochemistry* 2007; 102: 1395-1409.
- **Baier PC, Branisa P, Koch R, Schindehutte J, Paulus W, Trenkwalder C.** Circadian distribution of motor-activity in unilaterally 6-hydroxy-dopamine lesioned rats. *Experimental Brain Research* 2006; 169: 283-8.
- **Lebsanft HB, Kohles T, Kovar KA, Schmidt WJ.** 3,4-Methylenedioxyamphetamine counteracts akinesia enantioselectively in rat rotational behavior and catalepsy. *Synapse* 2005; 55: 148-55.
- **Lebsanft HB, Kovar KA, Schmidt WJ.** 3,4-Methylenedioxyamphetamine and naloxone in rat rotational behaviour and open field. *European Journal of Pharmacology* 2005; 516: 34-9.
- **Srinivasan J, Schmidt WJ.** Serotonergic influence on the potentiation of D-amphetamine and apomorphine-induced rotational behavior by the alpha(2)-adrenoceptor antagonist 2-methoxy idazoxan in hemiparkinsonian rats. *Journal of Neural Transmission* 2005; 112(9): 1223-36.
- **Baier PC, Schindehutte J, Thinyane K, Flugge G, Fuchs E, Mansouri A, Paulus W, Gruss P, Trenkwalder C.** Behavioral changes in unilaterally 6-hydroxy-dopamine lesioned rats after transplantation of differentiated mouse embryonic stem cells without morphological integration. *Stem Cells* 2004; 22(3): 396-404.
- **Breyse N, Baunez C, Spooren W, Gasparini F, Amalric M.** Chronic but not acute treatment with a metabotropic glutamate 5 receptor antagonist reverses the akinetic deficits in a rat model of parkinsonism. *The Journal of Neuroscience* 2002; 22(13): 5669-78.
- **Meissner W, Harnack D, Paul G, Reum T, Sohr R, Morgenstern R, Kupsch A.** Deep brain stimulation of subthalamic neurons increases striatal dopamine metabolism and induces contralateral circling in freely moving 6-hydroxydopamine-lesioned rats. *Neuroscience Letters* 2002; 328: 105-8.
- **Modo M, Stroemer RP, Tang E, Patel S, Hodges H.** Effects of implantation site of stem cell grafts on behavioral recovery from stroke damage. *Stroke* 2002; 33(9): 2270-8.
- **Reum T, Olshausen F, Mazel T, Vorisek I, Morgenstern R, Sykova E.** Diffusion parameters in the striatum of rats with 6-hydroxydopamine-induced lesions and with fetal mesencephalic grafts. *Journal of Neuroscience Research* 2002; 70: 680-93.
- **Drandarevski N, Marburger A, Walther D, Reum T, Uhl G, Morgenstern R.** Dopaminergic mRNA expression in the intact substantia nigra of unilaterally 6-OHDA-lesioned and grafted rats: an in situ hybridization study. *Journal of Neural Transmission* 2001; 108(2): 141-51.
- **Veizovic T, Beech JS, Stroemer RP, Watson WP, Hodges H.** Resolution of stroke deficits following contralateral grafts of conditionally immortal neuroepithelial stem cells. *Stroke* 2001; 32: 1012-9.
- **Spooren WP, Gasparini F, Bergmann R, Kuhn R.** Effects of the prototypical mGlu(5) receptor antagonist 2-methyl-6-(phenylethynyl)-pyridine on rotarod, locomotor activity and rotational responses in unilateral 6-OHDA-lesioned rats. *European Journal of Pharmacology* 2000; 406: 403-10.
- **Spooren WP, Waldmeier P, Gentsch C.** The effect of a subchronic post-lesion treatment with (-)-deprenyl on the sensitivity of 6-OHDA-lesioned rats to apomorphine and d-amphetamine. *Journal of Neural Transmission* 1999; 106: 825-33.
- **Reum T, Morgenstern R.** Fetal mesencephalic grafts influence the dopamine release in the non-lesioned striatum of 6-OHDA-lesioned rats: a behavioral and in vivo voltammetric study. *Neuroscience Letters* 1994; 173: 172-6.

Ordering Information

303311-C	<p>Rotameter Control Unit-8 to control up to 8 Rotameter Measuring Units, extendable*. Including connecting cables. The connection to the PC or notebook is done via a USB connector (USB 2.0 required).</p> <p><i>* Example: For a 16-place system please order 2 pcs. 303311-C Control Unit</i></p>
303311-ME	<p>Rotameter Measuring Unit Complete with Test Cage, Rotation Sensor, Tether & Jacket. For registration of rotational behavior in small laboratory animals. The smallest registered rotation is 1/250 turn. Consisting of:</p> <ul style="list-style-type: none"> • Test cage - please specify: <ol style="list-style-type: none"> 1. Bowl made of clear acrylic with foot 2. Cylinder made of grey PVC 3. Cylinder made of clear perspex • Rotation sensor • Tether with stainless steel spring • 1 Animal Jacket complete with adapter to tether / rotation sensor, Please specify: <ol style="list-style-type: none"> 1. Mouse Jacket, SMALL, up to 25 g 2. Mouse Jacket, MEDIUM, 25 to 30 g 3. Mouse Jacket, LARGE, 30+ g 4. Rat Jacket, X-SMALL, 100 to 150 g 5. Rat Jacket, SMALL, 150 to 250 g 6. Rat Jacket, MEDIUM, 250 to 350 g 7. Rat Jacket, LARGE, 350 to 500 g 8. Rat Jacket, X-LARGE, 500+ g 9. Rat Corset - universal size • Connecting cable (specify length: 2, 4, 6, 8 10, or 12 m)
303311-S	<p>Rotameter Software Package for WINDOWS The software is used to control the complete system, to determine the analysis interval (running minute or absolute date/time), to register clockwise rotations with a high resolution, counter clockwise rotations with a high resolution, changes of directions, to calculate total number of clockwise and counter clockwise rotations, to set marker text and to store and analyze the measuring data. Before starting the experiment, a wide range of animal and trial data can be entered into the Trial Preparation Window. A Trial Monitor shows the current experimental status. The running experiment is shown in the Trial Monitor. After the experiment a Run Table as well as a multifunctional graphics panel show the measuring data. All data are ready for export as an ASCII-format for the use in any standard statistics or graphics software (Excel and others).</p>
Cables	<p>These cables connect the measuring unit with the control unit</p>
303311-ME/CAB02	<p>Data cable 2 m for Rotameter</p>
303311-ME/CAB04	<p>Data cable 4 m for Rotameter</p>
303311-ME/CAB06	<p>Data cable 6 m for Rotameter</p>
303311-ME/CAB08	<p>Data cable 8 m for Rotameter</p>
303311-ME/CAB10	<p>Data cable 10 m for Rotameter</p>

303311-ME/CAB12	Data cable 12 m for Rotameter
Tether	
303311-ME/H	Replacement Tether with stainless steel spring for Rotameter Measuring Unit.
303311-ME/J	Replacement Animal Corset - universal size for Rotameter Measuring Unit.
Jackets	All jackets come complete with adapter to tether / rotation sensor
303311-ME/J-M1	Mouse Jacket, SMALL, up to 25 g for Rotameter Measuring Unit.
303311-ME/J-M2	Mouse Jacket, MEDIUM, 25 to 30 g for Rotameter Measuring Unit.
303311-ME/J-M3	Mouse Jacket, LARGE, 30+ g for Rotameter Measuring Unit.
303311-ME/J-R1	Rat Jacket, X-SMALL, 100 to 150 g for Rotameter Measuring Unit.
303311-ME/J-R2	Rat Jacket, SMALL, 150 to 250 g for Rotameter Measuring Unit.
303311-ME/J-R3	Rat Jacket, MEDIUM, 250 to 350 g for Rotameter Measuring Unit.
303311-ME/J-R4	Rat Jacket, LARGE, 350 to 500 g for Rotameter Measuring Unit.
303311-ME/J-R5	Rat Jacket, X-LARGE, 500+ g for Rotameter Measuring Unit.
Spare Parts	
303311-ME/S	Replacement Rotation Sensor Set for Rotameter Measuring Unit Consisting of: <ul style="list-style-type: none"> • Rotation sensor • Tether with stainless steel spring • Connecting cable
303311-ME/C	Replacement Test Cage Set for Rotameter Measuring Unit. Consisting of: Test cage choice (please specify): <ol style="list-style-type: none"> 1. Bowl made of clear acrylic with foot 2. Cylinder made of grey PVC 3. Cylinder made of clear Perspex



TSE Systems is a leading supplier of sophisticated research instrumentation in the global life science market. Our focus is on providing the total customer solution, with modular designs of integrated hardware and software platforms for neuroscience, metabolic and behavioral phenotyping, drug screening and toxicology. It is our corporate goal to become the number one manufacturer of highly sophisticated products in each market we serve.

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