



**Instruction Manual**  
**Rotary Gas Meters**  
Type RABO

**Betriebsanleitung**  
**Drehkolbengaszähler**  
Typ RABO

**Mode d'emploi**  
**Compteur de gaz à pistons rotatifs**  
Type RABO

**Manual de instrucciones**  
**Contador de gas de pistones rotativos**  
Modelos RABO

**Istruzioni d'uso**  
**Contatore gas a pistoncini rotanti**  
Tipo RABO

**Gebruiksaanwijzing**  
**Rotorgasmeters**  
Type RABO



**Instruction Manual**  
**Rotary Gas Meters**  
Type RABO



**RABO G16-G250**



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## 1. Staff

These **instructions are aimed at staff** who have adequate specialist and technical knowledge (in Germany, for instance, in accordance with DVGW Codes of Practice 492 and 495 or comparable technical regulations) on the basis of their training and experience in the sector of energy and gas distribution.

## 2. Legal Declarations

- Declaration of Conformity – see Annex C
- Period of validity of calibration – this is based on the regulations of the country concerned, in which the rotary gas meter will be used.
- The calibration of rotary gas meters is only valid for the period of validity of calibration. Once this has elapsed, rotary gas meters may no longer be used for purposes which are subject to obligatory calibration.

## 3. Intended Use and Field of Application

### This product is intended

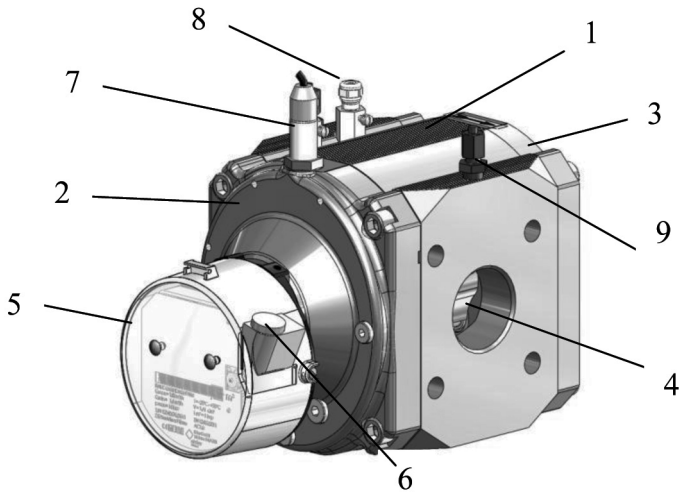
for **calibratable** volumetric metering of

- flammable gases: natural gas/town gas/propane/ butane,
- non-flammable gases: air/nitrogen/inert gases,
- and is suitable for use in potentially explosive atmospheres of Category 2 (Zone 1) of Class **EX II 2 G c IIC**.

Other fields of application / media on request.

This product is **not** intended for

- metering of aggressive gases, e.g. biogases or sewage gases, oxygen, acetylene, hydrogen.



- |   |                       |   |                        |
|---|-----------------------|---|------------------------|
| 1 | Meter housing         | 6 | LF pulse generator     |
| 2 | Housing cover (front) | 7 | HF pulse generator     |
| 3 | Housing cover (rear)  | 8 | Temperature test point |
| 4 | Pistons               | 9 | Pressure test point    |
| 5 | Index head            |   |                        |

Please contact your **Elster-Instromet Customer Service**  
**(Tel. +49 (0)6134-605-0 / -346)** for assistance in commissioning, maintenance  
 and installation of encoders, pulse generators and volume correctors for instance.

#### 4. Technical Data

**Rotary gas meters** in accordance with EN 12480

DN (mm)	Type	Q <sub>max</sub> (m³/h)	Q <sub>min</sub> (m³/h) Q <sub>t</sub> (m³/h)							
			1:160	1:130	1:100	1:80	1:65	1:50	1:30	1:20
32	16	25	-	-	-	-	-	-	0,8 3,75	1,3 5
32	25	40	-	-	-	-	0,6 2	0,8 4	1,3 6	2 8
32	40	65	-	-	0,6 3,25	0,8 3,25	1 3,25	1,3 6,5	2 9,75	3 13
32	65	100	0,6 5	0,8 5	1 5	1,3 5	1,6 5	2 10	3 15	5 20
40	16	25	-	-	-	-	-	-	0,8 3,75	1,3 5
40	25	40	-	-	-	-	0,6 2	0,8 4	1,3 6	2 8
40	40	65	-	-	0,6 3,25	0,8 3,25	1 3,25	1,3 6,5	2 9,75	3 13
40	65	100	0,6 5	0,8 5	1 5	1,3 5	1,6 5	2 10	3 15	5 20
50	16	25	-	-	-	-	-	-	0,8 3,75	1,3 5
50	25	40	-	-	-	-	0,6 2	0,8 4	1,3 6	2 8
50	40	65	-	-	0,6 3,25	0,8 3,25	1 3,25	1,3 6,5	2 9,75	3 13
50	65	100	0,6 5	0,8 5	1 5	1,3 5	1,6 5	2 10	3 15	5 20
50	100	160	1 8	1,3 8	1,6 8	2 8	2,5 8	3 16	5 24	8 32
80	100	160	1 8	1,3 8	1,6 8	2 8	2,5 8	3 16	5 24	8 32
80	160	250	1,6 12,5	2 12,5	2,5 12,5	3 12,5	4 12,5	5 25	8 37,5	13 25
80	250	400	2,5 20	3 20	4 20	5 20	6 20	8 40	13 60	20 80
100	160	250	1,6 12,5	2 12,5	2,5 12,5	3 12,5	4 12,5	5 25	8 37,5	13 25
100	250	400	2,5 20	3 20	4 20	5 20	6 20	8 40	13 60	20 80



Type	<b>RABO</b>
Size:	G 16 to G 250
Nominal diameter:	DN 32 to DN 100
Pressure ratings:	PN 16 or CLASS 150
Temperature ranges: - gas / ambient - storage	-25 °C to +70 °C -40 °C to +70 °C
Housing material:	Aluminium or Spheroidal graphite cast iron
Mechanical ambient conditions:	M1

### Pulse generators

LF pulse generator E1 (reed contact)	Wiegand pulse generator	HF pulse generator (acc. to EN 60947-5)
$U_{\max} = 24 \text{ V}$	$U_{\max} \leq 30 \text{ V}$	$U_{\text{rated}} = 8 \text{ VDC}$
$I_{\max} = 50 \text{ mA}$	$I_{\max} \leq 100 \text{ mA}$	$I \geq 3 \text{ mA}$ (exposed)
$P_{\max} = 0,25 \text{ VA}$	$P_{\max} \leq 600 \text{ mW}$	$I \leq 1 \text{ mA}$ (covered)
$R_i = 100 \Omega$ (series resistor)		$R_i = 1 \text{ k}\Omega$

### Absolute ENCODER S1D

	Absolut ENCODER S1D Index
Number of Indexes	2
Number of digit rollers per index	8
Temperature ranges	-25°C to +60°C
Safety class	IP 67
Interfaces and ATEX approval	NAMUR (II 2 G EEx ia IIC T4) or SCR/SCR+ (II 2 G EEx ib IIB T4) or M-BUS (without ATEX)
LF pulse generator	optional or retrofittable INS-10, -11, -12 $U_{\max} = 24 \text{ V}$ , $I_{\max} = 50 \text{ mA}$ , $P_{\max} = 0,25 \text{ VA}$ , $R_i = 100 \Omega$ (series resistor)

## 5. Operating Location

If you ...

- wish to mix in **odourisation agents** or
- use **solenoid valves**,

please always fit them only **downstream of the meter**. Otherwise, the device may be damaged.

The **flow** through the meter must be **free of vibrations / pulsations** in order to avoid measuring errors.

Compliance with the specified **operating and ambient conditions** as indicated on the type label is absolutely essential for **safe operation** of the meter and additional equipment.

The gas **may not contain suspended particles > 50 µm**. In addition, the **gas must be dry**. Otherwise, the meter may be damaged.

To protect the meter, a cone strainer with mesh size 250 µm must be installed on all new installations, and is also recommended for existing installations. When installing the meter in a vertical position, with the direction of flow from bottom to top, a strainer must be fitted to both the meter inlet and outlet (to protect against falling dirt).

## 6. Installation Position, Flow Direction

Gas can be fed through the RABO rotary gas meter both horizontally and vertically. The **piston shafts** and **digit rollers** on the index must always be **aligned horizontally**. The index can be turned through up to 355° for optimum ease of reading in different installation/operating positions.

## 7. Installation / Connection

**Warning! Never clean** the plastic hood of the index **with a dry cloth** owing to **the risk of explosion resulting from electrostatic discharge!** Please only ever use an adequately water - moistened cloth!

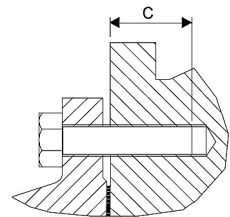


**Before installation** please ensure:

- that the **protective caps and/or plastic sheeting** is or are **removed**,
- that the meter and accessories **have been inspected for transport damage**,
- that the pistons rotate easily in the measuring chamber (e.g. by blowing on them),
- that the accessories have been checked for completeness (e.g. plug connectors, oil for initial filling).

**You will require** the following items for installation:

- Suitable seals/gaskets for the relevant gases.
- For installing the meter in the pipe, use screws in accordance with DIN 931. The screw length must be selected so that a thread reach of 16 - 22 mm into the meter is guaranteed. The recommended maximum tightening torque is defined in the table.



DN		Screw size	Screws per meter	Max. tightening torque Nm
32	PN 10/16	M16	8	50
	CLASS 150	M12	8	35
40	PN 10/16	M16	8	60
	CLASS 150	M12	8	40
50	PN 10/16	M16	8	60
	CLASS 150	M16	8	50
80	PN 10/16	M16	16	55
	CLASS 150	M16	8	85
100	PN 10/16	M16	16	60
	CLASS 150	M16	16	60

Then install the **meter**,

- gas-tight,
- with the supplied accessories,
- only in **flow direction** (as marked by an arrow on the meter housing or index head S1D),
- only **unstressed**,
- the piston axes must be **horizontal**, check using a spirit level.
- when fitting the seals and gaskets, ensure that they are **aligned concentrically** and do not project into the flow channel,
- weatherproof.

If you have specified the installation or operating position when ordering, all attachments will have been fitted in accordance with the installation position ex-works.

If you wish to **install the unit vertically at a later point**, you must turn the index head and other attachments, e.g. volume corrector, through 90°.

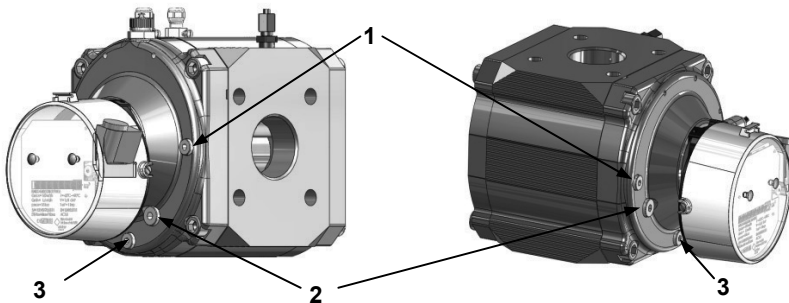
We recommend that you contact our **Elster-Instromet Customer Service** (Tel. +49 / (0)6134-605-0 / -346) for such conversion work.

## 8. Lubrication and Maintenance

- Only use **original spare parts supplied by Elster-Instromet**.
- **Fill with oil before commissioning.**
- To fill with oil, **depressurise** the meter.
- The quantity of oil required for operation, as well as a syringe for filling, are included in the delivery.
- Use Shell Morlina S2 BL 10 oil.  
(Inspection kit Ident.No. 73016605 or 73014893).
- There are two oil filling and draining openings (M10) and one oil level inspection opening (M12) on the front of the meter.
- Unscrew the filler neck (M10) and the oil level inspection nozzle (M12) in the front housing cover.
- Fill with oil slowly, using the syringe. The oil quantity is correct when the oil is visible in the threads of the oil level inspection borehole.  
The required quantity of oil depends on the installation position; for guidance, see table below.

Flow direction	G 16 to G 100	G 160 to G 250
Horizontal	25	25
Vertical	100	150

Guide values for oil quantity on commissioning and for oil changes (in ml)



1 = oil filling opening 2 = level inspection nozzle 3 = oil draining opening

- Reseal the oil filling and oil level inspection openings (seal with O-ring).
- Once it has been commissioned, the measuring instrument **does not** require any special servicing or **oil level inspections**. Generally the oil must be replaced **at least every 5 years**.
- **Never transport a rotary gas meter containing oil.**
- Make sure that the oil is drained out before transporting the meter (e.g. when sending the meter for repairs), **otherwise** the oil will penetrate the measuring chamber and **damage** the meter.

## 9. Commissioning

In order not to damage the meter,

- **slowly fill** the system until operating pressure is reached.
- The **pressure rise** may not exceed 350 mbar/s. You should use a bypass line for filling (recommendation: 12 mm pipe diameter).
- Do not exceed the **measuring range** even briefly!
- Conduct a **tightness test**!

**Important!** Dirt particles, such as welding beads, swarf and other foreign bodies, may be contained in the gas for a short while after installation.

**For this reason, always fit a coarse filter (e.g. cone strainer)** in order to avoid damage to the piston. **Do not forget** to remove the coarse filter after approx. 4 – 6 weeks since, should it become saturated, this would produce an obstacle to flow.

## 10. Decommissioning

- Slowly decrease the pressure (350 mbar/s).
- Open the couplings when the operating pressure is zero.
- Only remove the meter when the pipe has been depressurized.

## 11. Function Check by Means of Pressure Loss Measurement

The correct function of the rotary gas meter can be inferred by measuring the pressure loss. If the pressure loss has increased by more than 50% compared to the value at the initial start-up, then there may be dirt, for example, in the measuring chamber that can lead to an incorrect result being obtained. In comparing the pressure loss, the load and the operating pressure must be considered.

We recommend recording the pressure loss at several points in the flow when commissioning and logging these with the current operating pressure. If the current flow rate and operating pressure in later checks deviate from the original values, then the nominal pressure loss can be calculated from the original values. The pressure loss is proportional to the absolute pressure ( $p_{abs}$ ) and the square of the flow rate ( $Q$ ).

$$\Delta p \sim p_{abs} \cdot Q^2$$

## 12. Pulse Generators

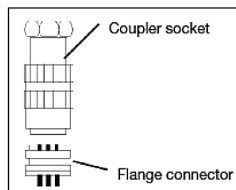
**LF pulse generators** (Type IN-S) or **Wiegand pulse generators** (Type IN-W) may be plugged onto the side of the index cover for **volume pulse output** to external devices (e.g. a volume corrector).

Fit the pulse generator (if required) as follows:

- Slide both **guides** of the pulse generator into the guide slot on the index cover until the guides can be heard to engage.
- Assign the **terminals** on the plug in accordance with the pin assignment on the meter / pulse generator.



- Optional you can use **HF pulse generators** for higher frequencies (Type A1K). HF pulse generators are screwed pressure-tight into the housing cover. The pulse values of the fitted pulse generators are stated on the meter.
- Assign the **terminals** on the plug in accordance with the pin assignment on the unit.
- The terminal assignment of the pulse generator is 5(+) and 6(-). The assignment refers to the plan view of the pin contacts of the fitted flange connector.
- Use a **screened cable** to the external device (in accordance with DIN 60079-14).



**Warning!** All pulse generators are intrinsically safe and may be connected only to **intrinsically safe circuits** if used in **potentially explosive atmospheres**. The safety barriers must comply with the requirements of ignition protection **Ex ib IIC** (see also Marking in Annex A). In addition, the device must not be installed on external sources of high or low temperatures whose temperature would result in a higher or lower ambient temperature for the device than the permitted ambient temperature range  $T_{amb} = -40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

### 13. Pressure Test Point

A straight male coupling in accordance with DIN 2353 is pre-fitted on the meter housing for connection of a pressure sensor for instance.

The **pressure test point** is marked  $p_m$  and is designed for connection of  $d = 6$  mm steel tube in accordance with DIN EN 10305-1 (e.g. steel grade E 235).

**Important: Do not** connect the straight male coupling to **pipes** made of **stainless steel** or pipes made of **nonferrous materials**.

**Note:** We recommend that you use original Parker-Ermeto pipe unions only. Functional safety and reliability are ensured only if the material combination of the union component and the pipe are matched. We recommend that you contact our **Elster-Instromet Customer Service (Tel. +49 (0)6134-605-0 /-346)** for conversion work and when installing additional devices.

### 14. Temperature Test Points

You can use a maximum of two **temperature sensors** for **measuring the gas temperature** in the meter housing.

Note that temperature measurement on measuring systems in the open air may be influenced by the ambient temperature. For this reason, the **metering elements** outside the pipe should be **adequately insulated** against ambient temperature influences. In order to achieve optimum thermal conduction, also fill the thermowell(s) with a heat-conductive fluid or paste.

If no temperature test points in the meter housing are planned, **measure the temperature** in the pipe **upstream of the rotary gas meter** at a distance of up to 3 x DN.





## 15. Index Versions

The meter can be equipped with various index versions:

### Index head S1V

- This is the standard version with an 8-digit mechanical roller index,
- The mechanical roller index can be read-off from the front,
- Can be rotated up to 355° about its axis,
- Suitable for outdoor installation,
- Designed for LF pulse generators which can be plugged on from the outside and which can be exchanged on site.



S1V

### Index head S1

- This has the same features as index head S1,
- Provides universal read-off.



S1

### Index head S1D

- This has the same features as index head S1V.
- It has two 8-digit mechanical roller indexes (depending on the flow direction, one index will be covered).
- Meter with S1D can be used in all installation positions.



S1D

### Index head MI-2

- Provides universal read-off,
- Can be rotated up to 355° about its axis,
- Can be optionally fitted with a mechanical index drive pointing upwards or backwards in accordance with EN 12480,
- Equipped with dry cartridge, lifetime of cartridge depends on installation conditions (minimum life 12 months), replace dry cartridge when colour has changed from blue to pink.



MI-2

## 16. Absolute ENCODER S1D

- This has the same features as index head S1D.
- Can be used as **main index on gas meters**.
- Available as a top-mounted unit (transmitter unit) on meters with mechanical index drive (index head version MI-2).
- The encoder is suitable for connection to a series-connected additional device (volume corrector, data logger or bus system) in potentially explosive atmospheres (see table: Technical Data). A device connected to the terminal box must feature at least the following approval as a related equipment for this:  
**[ EEx ia IIC ]** for version with Namur interface,  
**[ EEx ib IIC ]** for version with SCR and SCR Plus interface.  
 The version with M-BUS interface is not ATEX-approved!

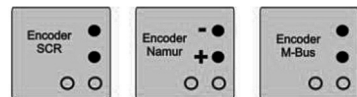


### Connection of the Absolute ENCODER S1D unit to the mechanical index drive of the meter

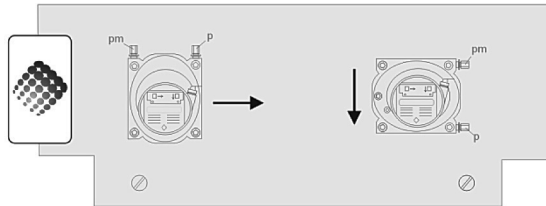
- Connect the connector of the top-mounted unit to the mechanical index drive of the driving unit (e.g. MI-2, ensure the steel disc is removed from the connector).
- Use a locking screw to secure the encoder top-mounted unit against pulling out.
- The locking screw must be lead-sealed for applications requiring mandatory calibration.

### Connection of the encoder

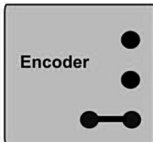
- Use only a screened cable (DIN EN 60079-14) to connect the encoder and ensure that the pin assignment is correct (see sticker next to the cover of the terminal box).
- When connecting the Namur interface, ensure that the 2-wire connection has the correct polarity. The M-Bus, SCR and SCR Plus interfaces are independent of the polarity.



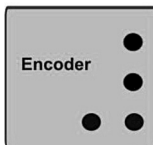
- It is possible to apply screening and to run a cable to the meter housing or the pipe. Make sure to check in advance that the earthing system used allows earthing on both sides (earth loops and potential difference in earthing).
- The assignment of the lower two terminals in the connection box of the encoder index determines the direction of gas flow:



**Bridge on lower terminals** (as delivered): Upper index is activated  
Flow direction: from **bottom to top** or from **right to left**.



**Lower terminals unassigned:** Lower index is activated  
Flow direction: from **left to right** or from **top to bottom**.



A **pulse generator** (Type LF) may be connected for pulse output to external devices (e.g. a volume corrector). Fit the pulse generator (if required) as described above in section 12.

## **17. Care and Cleaning**

- Clean off dirt on the meter only with a damp cloth.
- Do not clean the meter and its accessories with solvent.
- Any media gentle on the applicable materials can be used as cleaning media.

## **18. Recycling and Environmental Protection**

Elster-Instromet has reduced the transport packagings of the measuring instruments to the bare essentials. Packaging materials are always selected consistently with a view to recycling. The cardboard items used constitute secondary raw materials for the paperboard and paper industry. The Instapak® **foam packaging** items are **recyclable** and can be **reused**.





Plastic sheeting and strips/bands are also made of recyclable plastic.

At Elster-Instromet, subsequent recycling and disposal are already elements of the product development process. When selecting the materials, we allow for reusability of the materials, suitability of materials and subassemblies for dismantling and separation, and the risks of environmental pollution and health risks when recycling and dumping on landfill sites. The rotary gas meters mainly consist of metallic materials which can be melted down again in steelworks and metallurgical plants and which can thus be reused a virtually unlimited number of times. The plastics used are listed in Annex B so that sorting and separating of the materials for the purposes of subsequent recycling is possible.

The oil supplied is Shell Morlina S2 BL 10 (mineral oil), coloured red (pigment ratio 10 ml / 100 l oil) and, like all mineral oils (e.g. car engine oil), must be disposed of in an environmentally safe way.

## 19. Annex A

The pulse generators used in rotary gas meters have their own ATEX approvals (Ex approvals) and are marked in accordance with the table below:

Pulse generator Type	Designation of the sensors	EG Type- Examination Certificate Directive 94/9/EG Identification of the pulse generators	Manufacturer
LF pulse generators IN-S.. E1	Reed contacts	TÜV 03 ATEX 2123 Ex marking:  II 2 G Ex ia IIC T4 Gb  EN 60079-0: 2009 EN 60079-11: 2007	Elster GmbH 55252 Mainz-Kastel Germany
	Wiegand Sensor: Series 2000 magnetic sensor	FTZÜ 04 ATEX 0277 Ex marking:  II 2 G EEx ia IIC T6/T4  TÜV 01 ATEX 1776 Ex marking:  II 2 G EEx ia IIC T4	Elster s.r.o. 91601 Stará Turá Slovak Republic   Elster GmbH 55252 Mainz-Kastel Germany
HF pulse generator A1K	Slot-type initiator:	PTB 99 ATEX 2219 X Ex marking:  II 2 G Ex ia IIC T6	Pepperl + Fuchs GmbH 68307 Mannheim Germany

**20. Annex B**

Plastics used in rotary gas meters, see also section 18 “Recycling and Environmental Protection”.

Plastic parts	Abbreviation	Chem. name
Pulse generators	PA 6.6	Polyamide
Gear assembly	POM	Polyoxymethylene
Gears and small parts	POM	Polyoxymethylene
Counter cover and counter	PC	Polycarbonate
Counter bottom section	PPA	Polyphthalamide
Digit rollers	PA 12 PPO	Polyamide Polyphenylene oxyde

## 21. Annex C



### Declaration of Conformity



**Product** Gas Meters – Rotary Gas Meters

**Type, Model** RABO

	MID	PED	ATEX
<b>Product marking</b>	0102 DE-12-MI002-PTB001	0085 CE-0085CN0022	II 2 G c IIC T4
<b>EC-Directives</b>	<b>2004/22/EC</b>	<b>97/23/EC</b>	<b>94/9/EC</b>
<b>Standards</b>	EN 12480	EN 12480	EN 13463-1 EN 13463-5
<b>EC Type-Examination</b>	Notified Body 0102 Physikalisch-Technische Bundesanstalt (PTB) D-38116 Braunschweig	Notified Body 0085 DVGW D-53123 Bonn	
<b>Surveillance Procedure</b>	Notified Body 0102 2004/22/EC Annex D	Notified Body 0085 97/23/EG Module D	

#### We declare as manufacturer:

Products labelled accordingly are manufactured according to the listed Directives and Standards. They correspond to the tested type samples. The production is subject to the stated surveillance procedure. No additional ignition sources are created by assembly of the product's components.

2.7.2012

Division Director MMI

Head of R&D Industrial Gas Metering

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