

# THERMOVAC Transmitters

## TTR 91 (S)N / TTR 96 N / TTR 911 (C)N / TTR 916 N



THERMOVAC Transmitter TTR 91 N / 96 N / 911 N / 916 N, right: with display

The THERMOVAC Transmitters are active sensors using the unique MEMS-Pirani technology (Micro-Electro-Mechanical-Systems). They offer analog voltage output and the S-versions offer set point relays for improved process control. For chemical and aggressive applications, the C-versions are equipped with a Parylene HT®-coated sensor. The THERMOVAC series is also equipped with a LED-ring (360°) showing the status of the sensor.

The TTR 911 N and 916 N have a touch display and/or digital interfaces available.

### Advantages to the User

- Very robust MEMS-Pirani solid state sensor resilient to vibration and shock venting
- Fast response and high accuracy
- Individually temperature compensated to ensure stable measurements
- High reproducibility
- Measurement signal insensitive to mounting position
- Robust stainless steel housing
- Available with display for pressure units, set point parameters and operation status
- Available with up to three set point relays for improved process control
- Optional Computer interfaces: EtherCAT and RS 232
- Long tube version for reaching higher chamber bakeout temperatures
- LED ring to indicate status of the sensor

Parylene HT® is a registered trademark of Speciality Coating Systems Inc.

### Typical Applications

The THERMOVAC Transmitters offer a high degree of versatility. They are suited for applications in the medium and rough vacuum range.

Typical applications are:

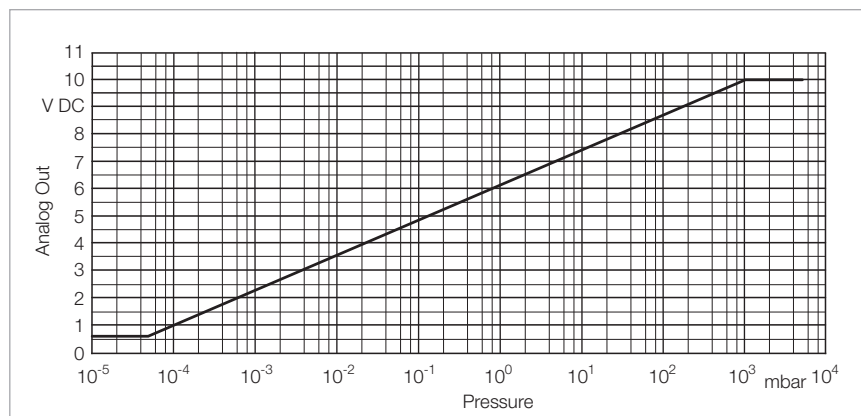
- Analytical instrumentation
- Research and development
- Vacuum Drying
- Controlling of ionization gauges
- Activation of UHV gauges
- System process control
- Process industry
- Coated versions for improved chemical resistance
- General foreline vacuum measurement

### Sensor

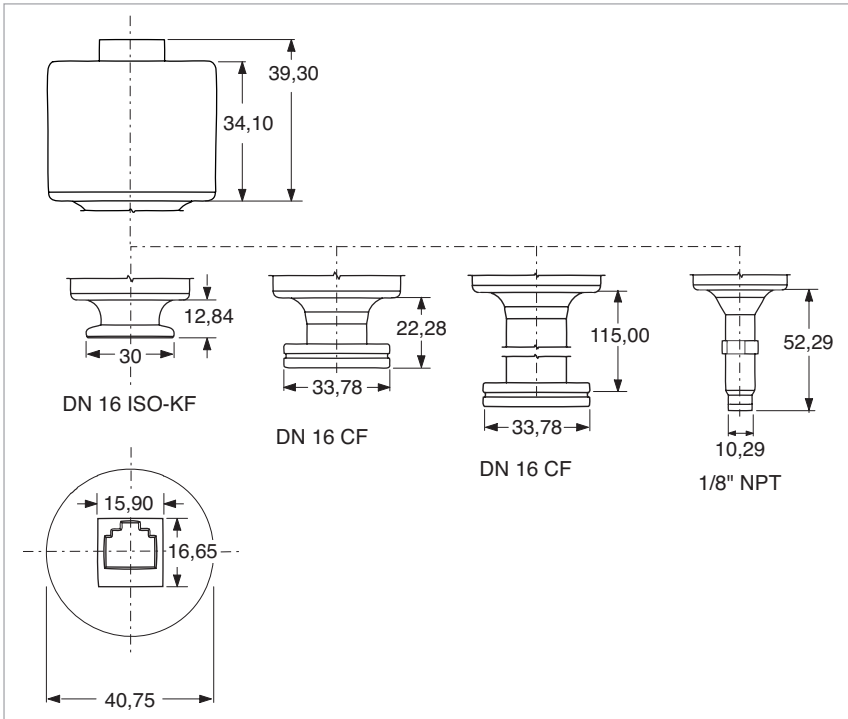
The THERMOVAC transmitters' measurement principle is based on thermal conductivity. The transmitters are equipped with a MEMS-Pirani sensing cell that consists of a silicon chip with a heated resistive element.

The THERMOVAC transmitters with the coated MEMS-Pirani are well suited for harsh processes and therefore more robust than the uncoated versions. Built-in relays allow switching functions to be performed directly by the transmitter, without the need of a programmable control.

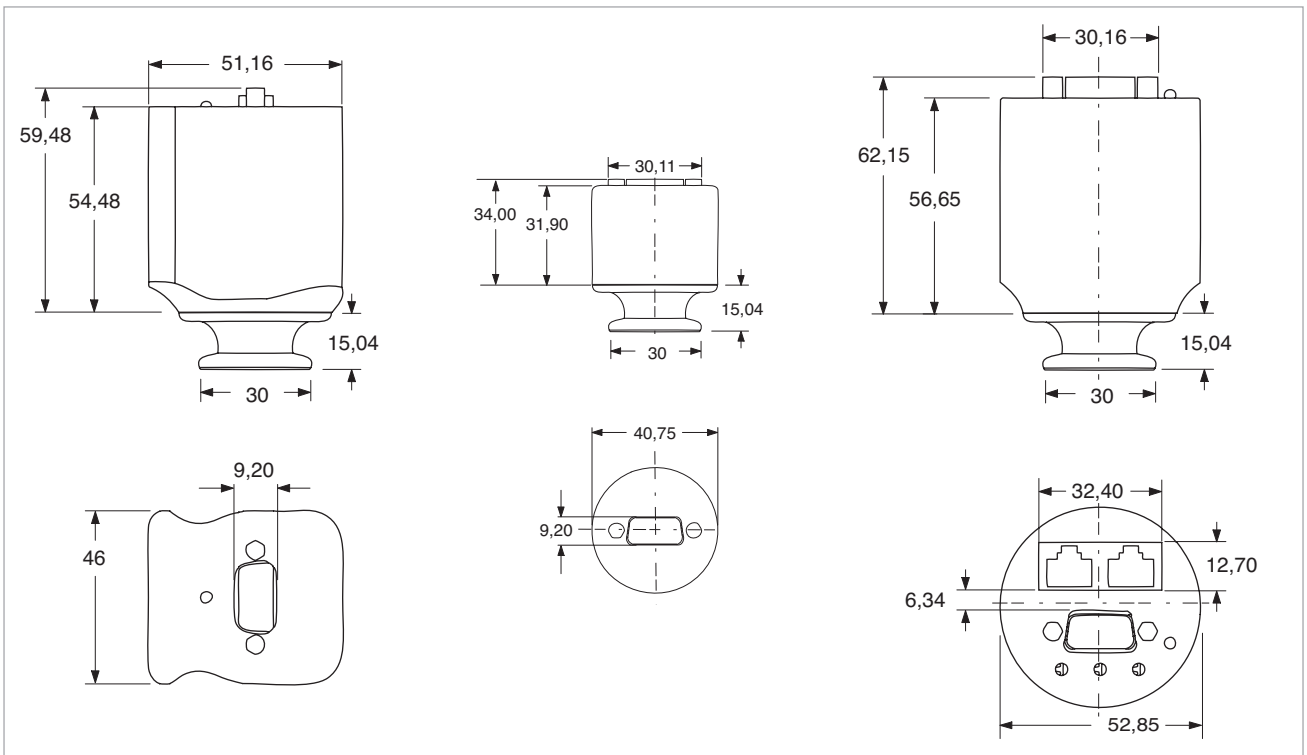
An integration of the transmitters in programmable control systems is facilitated by the linear characteristic, which can be defined by entering a simple equation into a PLC or computer.



Characteristic of the THERMOVAC Transmitters TTR 91 (S)N / TTR 96 N and TTR 911 (C)N / TTR 916 N



Dimensional drawings for the THERMOVAC Transmitters TTR 91 (S)N / TTR 96 N



Dimensional drawings for the THERMOVAC Transmitters TTR 911 (C)N / TTR 916 N  
 left: with display, middle: with RS 232, right: with EtherCAT

## Technical Data

## THERMOVAC Transmitter

TTR 91 N

TTR 91 SN

TTR 96 N

Measurement range	mbar (Torr)	5.0 x 10 <sup>-5</sup> to Atmosphere (3.75 x 10 <sup>-5</sup> to Atmosphere)		
Measurement uncertainty (typical) <sup>1)</sup>	mbar	5 x 10 <sup>-4</sup> to 1 x 10 <sup>-3</sup> ±10 % of reading 1 x 10 <sup>-3</sup> to 100 ±5 % of reading 100 to atm ±25 % of reading		
Repeatability (typical) <sup>1)</sup>	mbar	1 x 10 <sup>-3</sup> to 100 ±2 % of reading		
Sensor		MEMS-Pirani	MEMS-Pirani	Coated MEMS-Pirani
Measurement principle		Thermal conductivity according to Pirani		
Supply voltage	V DC	9 - 30		
Power consumption	W	< 1.2		
Electrical connection		FCC68 / RJ45		
Analog output	V DC	V <sub>out</sub> = log10(P <sub>mbar</sub> ) x 1.286 + 6.143 1.1 to 10		
Resolution	bit	16		
Impedance	Ω	100		
Update rate	Hz	16		
Interfaces		N / A		
Set point				
Range	mbar (Torr)		2.7 x 10 <sup>-4</sup> to 1000 (2.0 x 10 <sup>-4</sup> to 750)	
Relay		0	2	2
Relay contact rating		1 A @ 30 V AC/ DC, resistive load		
Relay contact resistance, max.	mΩ	100		
Relay contact endurance, min.		100 000		
1.0 A@ 30 V DC load		2 000 000		
0.2 A@ 30 V DC load				
Status indicators		LED-ring (360°)		
Max. cable length	m	100		
Overpressure limit	bar	6		
Operating temperature range	°C (°F)	0 to 40 (32 to 104)		
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)		
Max. bakeout temperature	°C (°F)	85 (185), non-operating		
Max. rel. humidity	% n.c.	≤ 95		
Installation orientation		Any		
Materials exposed to vacuum		304 stainless steel, Silicon, SiO <sub>2</sub> , Si <sub>3</sub> N <sub>4</sub> , <sup>1</sup> Tin, Gold, Viton®, low out gassing epoxy resin		304 stainless steel, Viton®, Parylene-HT®
Dead volume (DN 16 ISO-KF), approx.	cm <sup>3</sup>	2.80		
Weight (DN 16 ISO-KF)	g	170		
Protection class		40		
CE certification		EMC Directive 2004/108/EEC		
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE		

<sup>1)</sup> Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

## Technical Data

### THERMOVAC Transmitter TTR 911 (C/S/N)                      TTR 916 N

Measurement range	mbar (Torr)	5.0 x 10 <sup>-5</sup> to Atmosphere (3.75 x 10 <sup>-5</sup> to Atmosphere) 1.0 x 10 <sup>-5</sup> to Atmosphere (0.75 x 10 <sup>-6</sup> to Atmosphere) [RS 232 / EtherCAT / Display]
Measurement uncertainty (typical) <sup>1)</sup>	mbar	5.0 x 10 <sup>-4</sup> to 1.0 x 10 <sup>-3</sup> ±10 % of reading 1.0 x 10 <sup>-3</sup> to 100 ±5 % of reading 100 to atm ±25 % of reading
Repeatability (typical) <sup>1)</sup>	mbar	1 x 10 <sup>-3</sup> to 100 ±2 % of reading
Sensor		911 N: MEMS-Pirani 911 NC: Coated MEMS-Pirani
Measurement principle		Coated MEMS-Pirani - Thermal conductivity according to Pirani
Supply voltage	V DC	9 - 30
Power consumption	W	< 1.2
Electrical connection		FCC68 / RJ45
Analog output	V DC	$V_{out} = \log_{10}(P_{mbar}) \times 1.286 + 6.143$ 1.1 to 10
Resolution	bit	16
Impedance	Ω	100
Update rate	Hz	16
Interfaces		TTR 911 N Display: N / A TTR 911 (S)N: RS 232 TTR 911 (C)N: EtherCAT / Profibus
		TTR 916 N Display: N / A - -
Set point Range	mbar (Torr)	1.0 x 10 <sup>-4</sup> to 1000 (0.75 x 10 <sup>-5</sup> to 750) [Profibus] 2.7 x 10 <sup>-4</sup> to 1000 (2.0 x 10 <sup>-4</sup> to 750) [RS 232 / EtherCAT / Display] 2 [Profibus / EtherCAT / Display] / 3 [RS 232]
Relay		1 A @ 30 V AC/ DC, resistive load
Relay contact rating		100
Relay contact resistance, max.	mΩ	100 000
Relay contact endurance, min.		2 000 000
	1.0 A @ 30 V DC load	
	0.2 A @ 30 V DC load	
Status indicators		LED-ring (360°)
Max. cable length	m	100
Overpressure limit	bar	6
Operating temperature range	°C (°F)	0 to 40 (32 to 104)
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)
Max. bakeout temperature	°C (°F)	85 (185), non-operating
Max. rel. humidity	% n.c.	0 - 95
Installation orientation		Any
Materials exposed to vacuum		304 stainless steel, Silicon, SiO <sub>2</sub> , Si <sub>3</sub> N <sub>4</sub> , Tin, Gold, Viton®, low out gassing epoxy resin 304 stainless steel, Viton®, Parylene-HT®
Dead volume (DN 16 ISO-KF), approx.	cm <sup>3</sup>	2.80
Weight (DN 16 ISO-KF, RS 232 w/o Display)	g	168
Protection class	IP	40
CE certification		EMC Directive 2004/108/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

<sup>1)</sup> Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

## Ordering Information

## THERMOVAC Transmitter TTR 91 (S)N / TTR 96 N

	Part No.
Without switching threshold	
TTR 91 N, DN 16 ISO-KF	<b>230035V02</b>
TTR 91 N, 1/8" NPT	<b>230038V02</b>
TTR 91 N, DN 16 CF	<b>230036V02</b>
TTR 91 N, 1/2" Tube, DN 16 CF bakeable	<b>230037V02</b>
With switching threshold	
TTR 91 SN, DN 16 ISO-KF, 2SP	<b>230040V02</b>
TTR 91 SN, 1/8" NPT, 2SP	<b>230043V02</b>
TTR 96 N, DN 16 ISO-KF, 2SP	<b>230045V02</b>
TTR 96 N, 1/2" Tube, DN 16 CF bakeable	<b>230047V02</b>
Calibration	see chapter "Miscellaneous", para. "Oerlikon Leybold Vacuum Calibration Service"
Connection cable, FCC 68 on both ends, 8-way, shielded	<b>Type A</b>
5 m	<b>124 26</b>
10 m	<b>230012</b>
15 m	<b>12427</b>
20 m	<b>12428</b>
30 m	<b>12429</b>
50 m	<b>12431</b>
75 m	<b>12432</b>
100 m	<b>12433</b>
Accessories, optional	
Spiral tube DN 16 ISO-KF	<b>230082</b>

## Ordering Information

## THERMOVAC Transmitter

### TTR 911 (C/S)N

### TTR 916 N

	Part No.
TTR 911 N, DN 16 ISO-KF, EtherCAT	<b>230700V02</b>
TTR 911 CN, DN 16 ISO-KF, EtherCAT	<b>230701V02</b>
TTR 911 SN, DN 16 ISO-KF, RS 232	<b>89660V02</b>
TTR 911 C, DN 16 ISO-KF	<b>89658V02</b>
TTR 911 N, DN 16 ISO-KF, with display	<b>89654V02</b>
TTR 916 N, DN 16 ISO-KF, with display and coating	<b>89656V02</b>
Replacement sensor, DN 16 ISO-KF TTR 916 N	<b>230650V02</b>
TTR 916 CN	<b>230651V02</b>
Calibration	See Section "Miscellaneous", paragraph "Oerlikon Leybold Vacuum calibration service"
Connection cable, FCC 68 on both ends, 8-way, shielded	<b>Type A</b>
5 m	<b>124 26</b>
10 m	<b>230012</b>
15 m	<b>12427</b>
20 m	<b>12428</b>
30 m	<b>12429</b>
50 m	<b>12431</b>
75 m	<b>12432</b>
100 m	<b>12433</b>
Optional accessories	
Spiral tube DN 16 ISO-KF	<b>230 082</b>

# THERMOVAC Transmitters TTR 101 (S)N



THERMOVAC Transmitter TTR 101 N, right: with display

The THERMOVAC TTR 101 N models utilize a thermal conductivity MEMS-Pirani combined with a silicon membrane Piezo. They offer superior accuracy and gas type independent readings between 10 mbar and 1500 mbar.

## Advantages to the User

- Wide measurement range combining two sensor technologies into a single output
- Robust MEMS-Pirani and Piezo solid state sensors resilient to vibration and shock venting
- Rapid cycling by fast and repeatable pressure measurements
- High reproducibility and high accuracy
- Gas type independent from 10 to 1500 mbar
- Autozero of Piezo
- Individually temperature compensated to ensure stable measurements
- Measurement signal insensitive to mounting position
- Available with display for pressure units, set point parameters and operation status
- Available with up to three set point relays for improved process control
- LED ring to indicate status of the sensor

## Typical Applications

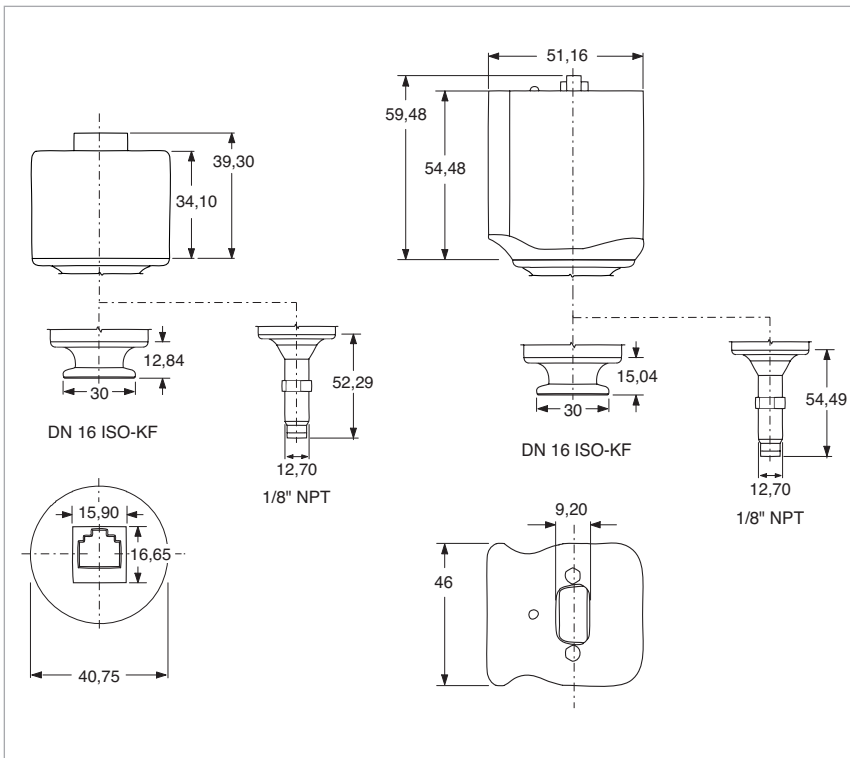
The THERMOVAC TTR 101 N transmitters can be used in any application that requires absolute pressure measurement and switching capabilities.

- General vacuum measurement and control from low to medium vacuum pressure
- Safety circuits in vacuum systems
- Control of high vacuum ionization gauges
- Analytical Instrumentation
- Research and development
- Vacuum Drying
- System process control
- Vacuum furnaces and sintering
- Coating
- Process industry

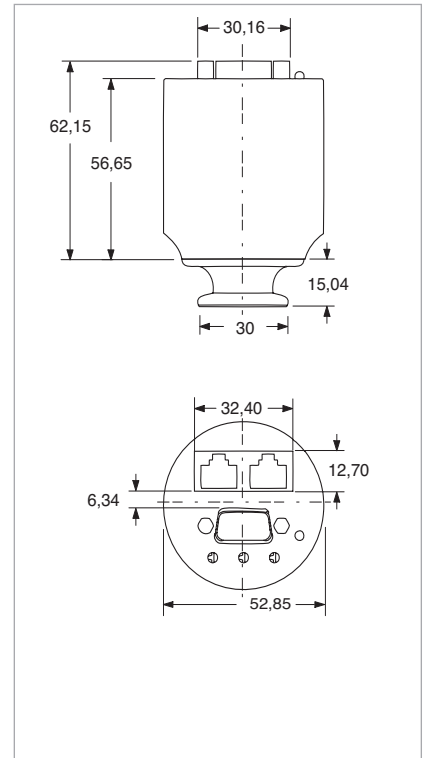
## Sensor

Dust and other particles may cause measurement errors and reduced lifetime. Therefore we recommend the installation of a fine filter in critical applications.

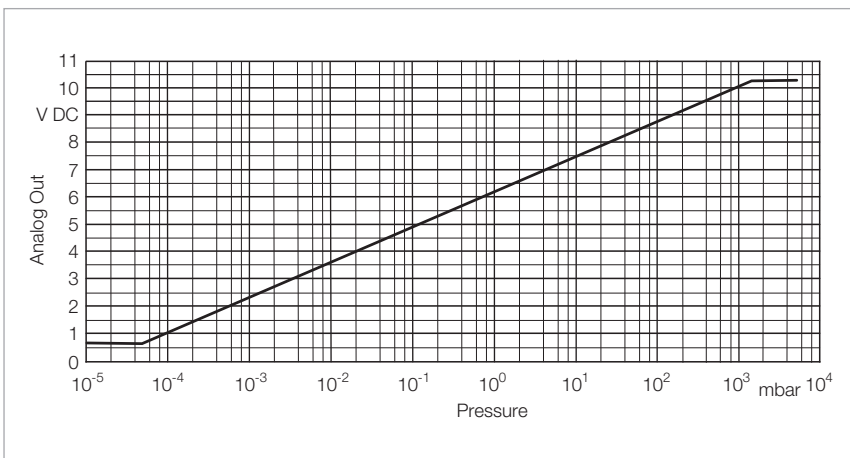
Fine filters are listed in chapter "General", para. "Connection Accessories for Small Flanges".



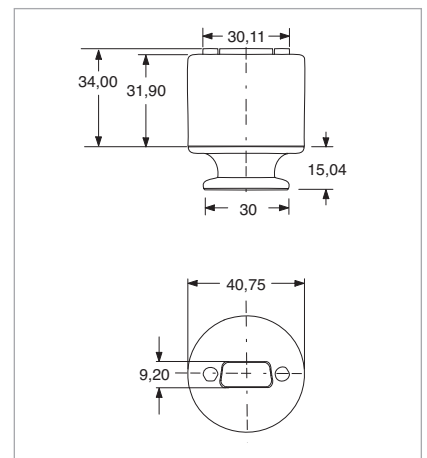
Dimensional drawing for the THERMOVAC Transmitters TTR 101 (S) N (left) and TTR 101 N Display (right)



Dimensional drawing for the TTR 101 N (EtherCAT)



Characteristic of the THERMOVAC Transmitters TTR 101 (S)N



Dimensional drawing for the TTR 101 N (RS 232)



## Technical Data

## THERMOVAC Transmitter TTR 101 (S)N

Measurement range	mbar (Torr)	5 x 10 <sup>-5</sup> to 1500 (3.75 x 10 <sup>-5</sup> to 1125) 1 x 10 <sup>-5</sup> to 2000 (0.75 x 10 <sup>-5</sup> to 1500) [RS 232 / Display / EtherCAT]
Measurement uncertainty (typical) <sup>1)</sup>	mbar	5 x 10 <sup>-4</sup> to 1 x 10 <sup>-3</sup> ±10 % of reading 1 x 10 <sup>-3</sup> to 11 ±5 % of reading 1 x 10 <sup>-3</sup> to 100 ±5 % of reading [RS 232 (Pirani) / EtherCAT (Pirani)] 0.1 x 10 ±1 % of reading ±0.5 mbar [RS 232 (Piezo) / EtherCAT (Piezo)] 10 to 1333 ±0.75 % of reading [RS 232 (Piezo) / EtherCAT (Piezo)] 11 to 1333 ±0.75 % of reading 100 to atm. ±25 % of reading [RS 232 (Pirani) / EtherCAT (Pirani)] 1333 to 1500 ±2 % of reading 1333 to 2000 ±2 % of reading [RS 232 (Piezo) / EtherCAT (Piezo) / Display]
Repeatability (typical) <sup>1)</sup>	mbar	1 x 10 <sup>-3</sup> to 11 ±2 % of reading 1 x 10 <sup>-3</sup> to 100 ±2 % of reading [RS 232 (Pirani) / EtherCAT (Pirani)] 10 to 1067 ±0.2 % of reading / EtherCAT (Piezo) 11 to 1067 ±0.2 % of reading
Sensor		
101 (S)N		MEMS-Pirani and Piezo
101 N, EtherCAT		MEMS-Pirani and Piezo
101 N, Display		MEMS-Pirani and Piezo
101 N, Profibus		MEMS-Pirani and Piezo
101 N, RS 232		MEMS-Pirani and Piezo
Measurement principle		Thermal conductivity combined with Piezo
Supply voltage	V DC	9 - 30
Power consumption	W	< 1.2 [2 for EtherCAT]
Electrical connection		1x FFC68 or 2x FCC68 + 1x D-Sub 15 PIN
Analog output	V DC	$V_{out} = \log_{10}(P_{mbar}) \times 1.286 + 6.143$ 0.61 to 10.23
Resolution	bit	16
Impedance	Ω	100
Update rate	Hz	16
Interfaces		RS 232 / Display / EtherCAT / Profibus
Set point		
Range	mbar (Torr)	2.7 x 10 <sup>-4</sup> to 1000 (2.7 x 10 <sup>-4</sup> to 750) / 1.0 x 10 <sup>-4</sup> to 1000 (0.75 x 10 <sup>-4</sup> to 750) [RS 232 / Display] 2 / 3 [RS 232]
Relay		
Relay contact rating		1 A @ 30 V AC/ DC, resistive load / [EtherCAT: N/A]
Relay contact resistance, max.	mΩ	100 / [EtherCAT: N/A]
Relay contact endurance, min.		100 000 / [EtherCAT: N/A]
1.0 A@ 30 V DC load		2 000 000 / [EtherCAT: N/A]
0.2 A@ 30 V DC load		
Status indicators		LED-ring (360°)
Max. cable length	m	100
Overpressure limit	bar	2
Operating temperature range	°C (°F)	0 to 40 (32 to 104)
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)
Max. bakeout temperature	°C (°F)	85 (185), non-operating
Max. rel. humidity	% n.c.	0 - 95
Installation orientation		Any
Materials exposed to vacuum for Part-Nos. 230350V02, 230351V02, 230352V02, 230353V02, 230354V02, 230355V02, 230356V02, 230358V02, 230366V02, 230702V02		304 stainless steel, Silicon, SiO <sub>2</sub> , Si <sub>3</sub> N <sub>4</sub> , Tin, Gold, Viton®, low out gassing epoxy resin
Dead volume (DN 16 ISO-KF), approx.	cm <sup>3</sup>	2.8
Weight (DN 16 ISO-KF)	g	168
Protection class	IP	40
CE certification		EMC Directive 2004/108/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

<sup>1)</sup> Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

## Ordering Information

## THERMOVAC Transmitter TTR 101 (S)N

	Part No.
TTR 101 N, DN 16 ISO-KF	<b>230350V02</b>
TTR 101 N, 1/8" NPT	<b>230351V02</b>
TTR 101 N, DN 16 ISO-KF, 2SP	<b>230352V02</b>
TTR 101 N, 1/8" NPT, 2SP	<b>230353V02</b>
TTR 101 N, DN 16 ISO-KF, Display	<b>230354V02</b>
TTR 101 N, 1/8" NPT, Display	<b>230355V02</b>
TTR 101 N, DN 16 ISO-KF, Display, 2SP	<b>230356V02</b>
TTR 101 N, DN 16 ISO-KF, RS 232, 3SP	<b>230366V02</b>
TTR 101 N, DN 16 ISO-KF, EtherCAT, 3SP	<b>230370V02</b>
Replacement sensor DN 16 ISO-KF 1/8" NPT	<b>230361V02</b> <b>230362V02</b>
Centering ring with fine filter 16 ISO-KF	<b>883 96</b>
Calibration	See Section "Miscellaneous", paragraph "Oerlikon Leybold Vacuum calibration service"
Connection cable, FCC 68 on both ends, 8-way, shielded 5 m 10 m 15 m 20 m 30 m 50 m 75 m 100 m	<b>Type A</b> <b>124 26</b> <b>230012</b> <b>12427</b> <b>12428</b> <b>12429</b> <b>12431</b> <b>12432</b> <b>12433</b>
Optional accessories Spiral tube DN 16 ISO-KF	<b>230 082</b>

# Loadlock Transmitter

## THERMOVAC TTR 200 N PENNINGVAC PTR 200 N



THERMOVAC Transmitter TTR 200 N (left) and PENNINGVAC Transmitter PTR 200 N (right)

The TTR 200 N and PTR 200 N combine different measurement technologies in one housing making them the perfect gauges for load lock applications. The transmitters offer a wide absolute measurement range and a differential range of  $-10^{13}$  to  $10^{13}$  mbar (relative to ambient pressure). The highly accurate differential sensor is ideal for loadlock control since it is insensitive to changes in ambient pressure conditions. Efficient loadlock control will improve throughput due to reduced cycle time.

### Advantages to the User

- Fast, accurate and repeatable pressure measurements reduce process cycle time
- Gas type independent pressure measurements from 50 mbar to 1300 mbar
- Combination of absolute and differential measurements offer unprecedented loadlock control
- Three integrated setpoints
- Up to three sensors in one housing for a wide measurement range
- Measurement signal insensitive to mounting position
- Ease of operation via analog output and digital communication
- LED ring to indicate status of the sensor

### Typical Applications

- Load lock applications
- Coating Systems (e. g. UNIVEX)
- Vacuum chamber production
- Processes requiring both absolute pressure measurement and atmospheric switching capabilities
- Analytical equipment (e. g. mass spectrometer control)
- Scanning electron microscopes

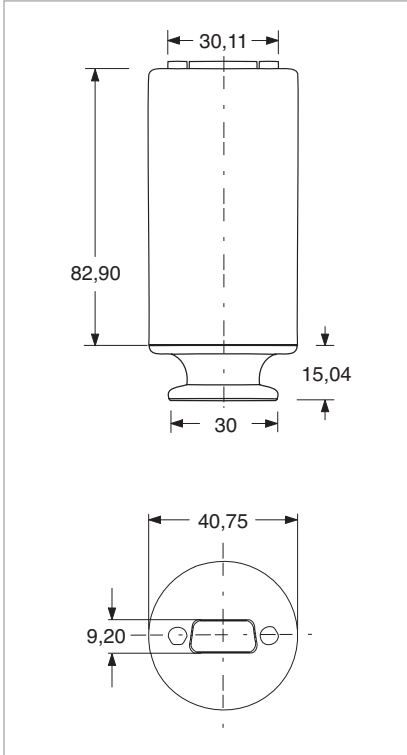
### Option

For protection of the sensor TTR 200 N and PTR 200 N against contamination, radiation and other disturbing factors the installation of a baffle is recommended.

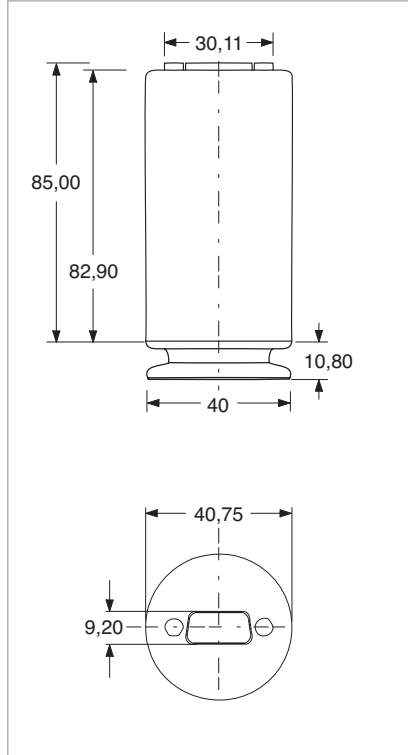
Two types of baffles are available: A build-in version for CF connections is mounted in the sensor; the baffle for ISO-KF connections is integrated in a centering ring.



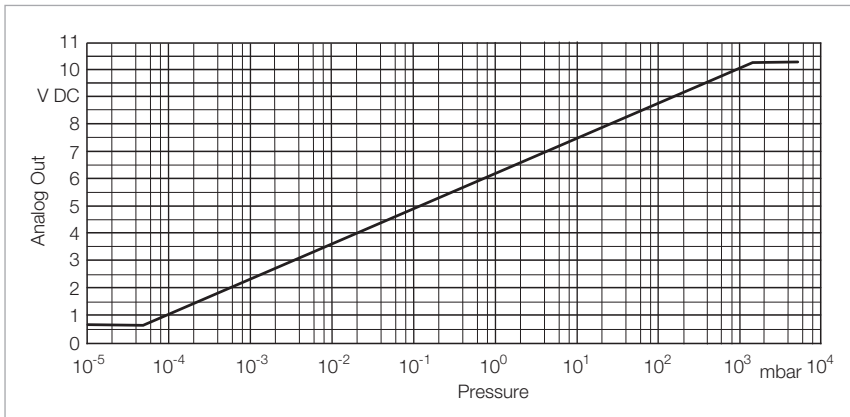
Baffle DN 25 ISO-KF, with centering ring, Part No. 230 078



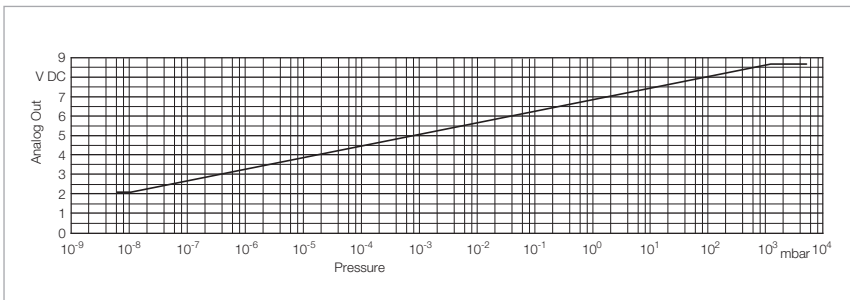
Dimensional drawing for the THERMOVAC transmitter TTR 200 N



Dimensional drawing for the PENNINGVAC transmitter PTR 200 N



Characteristic of the THERMOVAC Transmitter TTR 200 N



Characteristic of the PENNINGVAC transmitter PTR 200 N

## Technical Data

## Loadlock Transmitter

### TTR 200 N

### PTR 200 N

Measurement range (N <sub>2</sub> and air) absolute	mbar (Torr)	5.0 x 10 <sup>-5</sup> to 1500 (3.75 x 10 <sup>-5</sup> to 1125) 5 x 10 <sup>-5</sup> to 1500 [RS 232] (3.75 x 10 <sup>-5</sup> to 1125) [RS 232]	1.0 x 10 <sup>-9</sup> to 1500 (0.75 x 10 <sup>-5</sup> to 1125) 1 x 10 <sup>-9</sup> to atm. [RS 232] (0.75 x 10 <sup>-9</sup> to atm.) [RS 232]
differential	mbar (Torr)	-1013 to 1013 [RS 232] (-760 to 760) [RS 232]	-1013 to 1013 [RS 232] (-760 to 760) [RS 232]
Measurement uncertainty (typical) <sup>1)</sup>			
Cold cathode	mbar	— — — —	1 x 10 <sup>-8</sup> to 1 x 10 <sup>-3</sup> ±30 % of reading 1 x 10 <sup>-4</sup> to 1 x 10 <sup>-3</sup> ±10 % of reading 1 x 10 <sup>-3</sup> to 100 ±5 % of reading 100 to atm. ±25 % of reading
MEMS-Pirani	mbar	1 x 10 <sup>-4</sup> to 1 x 10 <sup>-3</sup> ±10 % of reading 1 x 10 <sup>-3</sup> to 100 ±5 % of reading 100 to atm. ±25 % of reading	1 x 10 <sup>-4</sup> to 1 x 10 <sup>-3</sup> ±10 % of reading 1 x 10 <sup>-3</sup> to 100 ±5 % of reading 100 to atm. ±25 % of reading
Diff. Piezo	mbar	-10 to 10 ±10 % of reading ±0.67 mbar -100 to -10 ±8 % of reading -1013 to -100 ±1 % of reading 10 to 100 ±5 % of reading	10 to 10 ±10 % of reading ±0.67 mbar -100 to -10 ±8 % of reading -1013 to -100 ±1 % of reading 10 to 100 ±5 % of reading
Repeatability (typical) <sup>1)</sup>			
Penning	mbar	1 x 10 <sup>-3</sup> to 100 ±2 % of reading	1 x 10 <sup>-8</sup> to 1 x 10 <sup>-3</sup> ±30 % of reading
MEMS-Pirani	mbar	1 x 10 <sup>-3</sup> to 100 ±2 % of reading	1 x 10 <sup>-3</sup> to 100 ±2 % of reading
Diff. Piezo	mbar	-1013 to 10 ±1 % of reading	-1013 to -10 ±1 % of reading
Sensor Measurement principle		MEMS-Pirani and Diff. Piezo Thermal conductivity, combined with Piezo	Cold cathode, MEMS-Pirani and Diff. Piezo Thermal conductivity, combined with Piezo and cold cathode ionization
Supply voltage	V DC	9 - 30	9 - 30
Power consumption	W	< 1.2	< 2
Electrical connection		D-Sub 15 pin	D-Sub 15 pin
Analog output	V DC	V <sub>out</sub> = log <sub>10</sub> (P <sub>mbar</sub> ) x 1.286 + 6.143 0.61 to 10.23	V <sub>out</sub> = log <sub>10</sub> (P <sub>mbar</sub> ) + 6.8 2.0 to 8.667
Resolution	bit	16	16
Impedance	Ω	100	100
Update rate	Hz	16	16
Interfaces		RS 232	RS 232
Set point			
Range			
Absolute	mbar (Torr)	1 x 10 <sup>-4</sup> to 1333 (0.75 x 10 <sup>-4</sup> to 1000)	1 x 10 <sup>-8</sup> to 1333 (0.75 x 10 <sup>-8</sup> to 1000)
Differential	mbar (Torr)	-1013 to 133 (-775 to 100)	-1013 to 133 (-775 to 100)
Relay		3	3
Relay contact rating		1 A @ 30 V AC/ DC, resistive load	1 A @ 30 V AC/ DC, resistive load
Relay contact resistance, max.	mΩ	100	100
Relay contact endurance, min.			
1.0 A@ 30 V DC load		100 000	100 000
0.2 A@ 30 V DC load		2 000 000	2 000 000
Status indicators		LED-ring (360°)	LED-ring (360°)
Max. cable length	m	20	20
Overpressure limit	bar	2	2
Operating temperature range	°C (°F)	0 to 40 (32 to 104)	0 to 40 (32 to 104)
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)	-20 to +65 (-4 to 149)
Max. bakeout temperature	°C (°F)	85 (185), non-operating	85 (185), non-operating
Max. rel. humidity	% n.c.	0 - 95	0 - 95
Installation orientation		Any	Any
Materials exposed to vacuum		304 stainless steel, Silicon, SiO <sub>2</sub> , Si <sub>3</sub> N <sub>4</sub> , Tin, Gold, Viton®, low out gassing epoxy resin	304 stainless steel, 403 stainless steel, Ceramic (Al <sub>2</sub> O <sub>3</sub> ), Silicon, SiO <sub>2</sub> , Si <sub>3</sub> N <sub>4</sub> , Tin, Gold, Viton®, Titanium, low out gassing epoxy resin
Dead volume (DN 16 ISO-KF), approx.	cm <sup>3</sup>	2.8	28.6
Weight (DN 16 ISO-KF)	g	305	321
Protection class	IP	40	40
CE certification		EMC Directive 2004/108/EEC	EMC Directive 2004/108/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE	DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

<sup>1)</sup> Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

**Ordering Information****Loadlock Transmitter****TTR 200 N****PTR 200 N**

	<b>Part No.</b>	<b>Part No.</b>
THERMOVAC TTR 200 N DN 16 ISO-KF, 3SP	<b>230365V02</b>	-
PENNINGVAC PTR 200 N DN 25 ISO-KF, RS 232, 3 SP	-	<b>230087V02</b>
Replacement cathode plate	-	<b>EK16991V02</b>
Replacement anode ring	-	<b>20028711V02</b>
Baffle, with centering ring (FPM (FKM)) DN 25 ISO-KF	- -	<b>230 078</b>
Centering ring with fine filter DN 16 ISO-KF	<b>883 96</b>	-