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Пассивные измерительные системы для термоядерных проектов ITER

ITER Product Catalogue

Total Pressure Measurement

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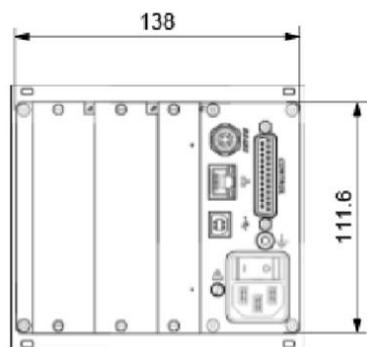
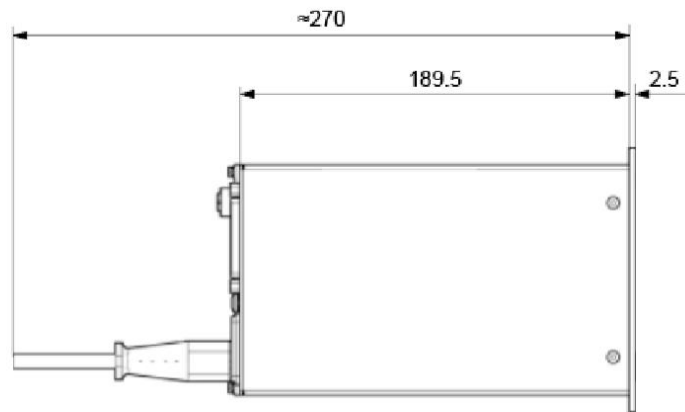
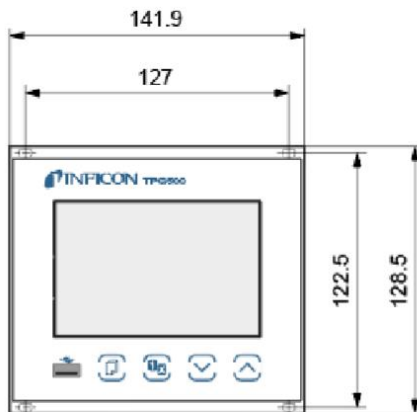
TPG 500 Passive Gauge Controller

Modular plug-in circuit boards for measurement and communication for 4 gauge heads.

Ideal controller for 4 gauge heads under extreme conditions such as high radiation environment and high temperature bake-out.



DIMENSIONS



SPECIFICATION

Display Range	1000 ... 1x10 ⁻¹¹ mbar (depends on used gauge and boards)
Measured value display	15 mm character height / 7 segment
Unit of measure	mbar, Torr, Pa; hPa; micron; V; A
Set point / relays	Lower and upper threshold / 4 relays
Error display / relay	Red segment / 1 relay
Measurement rate	≥ 100/s
Display rate	≥ 10/s
Temperature: Storage	-20 to +60° C
Operating	+5 to +50° C
Radiation resistant	no
Maximum magnetic field (with IF300P) ^{*1}	To be tested with TPG 500
Maximum magnetic field (with IF301P) ^{*1}	To be tested with TPG 500
Main requirement: Voltage (range)	100 ... 240 VAC ±10%
Frequency (range)	50 ... 60 Hz
Power consumption	≤65 W
Overvoltage category	II
Relative humidity	≤80% at temperatures up to +31° C decreasing to 50% at +40° C
Use	Indoors only, height up to 2000 m
Safety	European appliance connector IEC 320 C14; class 1
Weight (without boards)	1.45 kg

ORDERING INFORMATION

Controller Unit TPG 500	IO398400
Delivery time	3 weeks
ITER Status	TPG500 in qualification

ACCESSORIES

Blind plate instead Measure board	BG441259
Blind plate for IF300	BG441017
Mains cable, German plug, 2.5 m	303-350
Mains cable, U.S. plug, 2.5 m	303-353
Mains cable, U.K. plug, 2.5 m	303-354
Mains cable, Japan, 2.5 m	303-352
Mains cable, Korea plug, 2.5 m	303-351
Rack 19" for 3 TPG500 modules	IT491211

CABLES

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^{1*} Tested to 3 dB margin as per Test method for ITER equipment for static (d.c.) magnetic fields(ITER D 98IL4W)

Pirani/Cold Cathode Measurement Board CP 300 C9

For TPG 500 Measurement Unit

Measurement and control down to 10^{-9} mbar

Bayonet SHV Connector



SPECIFICATION

	CP 300 C9
Measurement Boards	Pirani / Cold Cathode
Number of measuring circuits	1 Pirani and 1 Cold Cathode
Gauge	ITER TPR018, IKR084 and IKR085
Display range max.	1000 mbar
Display range min.	5×10^{-9} mbar
Temperature: Operating	5 to 50° C
Radiation resistant	no
Max. applicable magnetic field	See TPG500
Sensor cable length	< 100 m
Reaction time of the output signal: Rise	
Pirani:	50ms (Sudden pressure changes: Rise (10-90% from 10^{-3} to 10^3 mbar)
Cold Cathode:	10 ms (Sudden pressure changes: Rise (10-90% from 10^{-9} to 10^{-3} mbar)
Weight	0.21 kg

ORDERING INFORMATION

Measurement Board	IO441000
Delivery time	2 weeks
ITER Status	Qualified

ACCESSORIES

Pirani Connector	In qualification
Cold Cathode connector	In qualification
Lab plug 2mm LS205	IT4711152MA
Red isolation KT205	IT4711152N2
Black isolation KT205	IT4711152NZ

CABLES

Please see page Fehler! Textmarke nicht definiert. and following	
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Pirani / Cold Cathode Measurement Board CP 300 T11

For TPG 300 Measurement Unit

Measurement and control down to 10^{-11} mbar

Triaxial Push & Pull Connector



SPECIFICATION

	CP 300 T11
Measurement Boards	Pirani / Cold Cathode
Number of measuring circuits	1 Pirani and 1 Cold Cathode
Gauge	ITER TPR018 and IKR086
Display range max.	1000 mbar
Display range min. *	1×10^{-11} mbar
Temperature: Operating	5 to 50° C
Radiation resistant	no
Max. applicable magnetic field	See TPG500
Sensor cable length max.	Pirani 100 m, Cold cathode 500m
Reaction time of the output signal: Rise	
Pirani:	50ms (Sudden pressure changes: Rise (10-90% from 10^{-3} to 10^3 mbar)
Cold Cathode:	50 ms (Sudden pressure changes: Rise (10-90% from 10^{-9} to 10^{-3} mbar)
Weight	0.25 kg

ORDERING INFORMATION

Measurement Board	IO441080
Delivery time	2 to 3 weeks
ITER Status	Available, in qualification

ACCESSORIES

Pirani connector Amphenol C91	In qualification
Cold Cathode connector	In qualification
Lab plug 2mm LS205	IT4711152MA
Red isolation KT205	IT4711152N2
Black isolation KT205	IT4711152NZ

CABLES

Please see page Fehler! Textmarke nicht definiert and following	
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Pirani / Cold Cathode Measurement Board CP 300 T11L

For TPG 500 Measurement Unit

Measurement and control down to 10^{-11} mbar

Pirani long cable version up to 500m

Triaxial Push & Pull Connector



SPECIFICATION

	CP 300 T11L
Measurement Boards	Pirani / Cold Cathode
Number of measuring circuits	1 Pirani and 1 Cold Cathode
Gauge	ITER TPR018 and IKR086
Display range max.	1000 mbar
Display range min. *	1×10^{-11} mbar
Temperature: Operating	5 to 50° C
Radiation resistant	no
Max. applicable magnetic field	See TPG500
Sensor cable length max.	Pirani 500 m, Cold cathode 500m
Reaction time of the output signal: Rise	
Pirani:	50ms (Sudden pressure changes: Rise (10-90% from 10^{-3} to 10^3 mbar)
Cold Cathode:	50 ms (Sudden pressure changes: Rise (10-90% from 10^{-9} to 10^{-3} mbar)
Weight	0.25 kg

ORDERING INFORMATION

Measurement Board	IO441120
Delivery time	2 to 3 weeks
ITER Status	Available, in qualification

ACCESSORIES

Pirani connector Amphenol C91	In qualification
Cold Cathode connector	In qualification
Lab plug 2mm LS205	IT4711152MA
Red isolation KT205	IT4711152N2
Black isolation KT205	IT4711152NZ

CABLES

Please see page Fehler! Textmarke nicht definiert and following	
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Interface and Relay Board

IF 300 A

RS communication to control controller measurement system

Hard wired set points relay outputs.

SPECIFICATION

	IF 300 A
Relay Numbers	4 mechanical relay for set point, 1 error relay all with change over contacts potential free.
Relay connector, 15 pin	D-Sub
Relay: Switching voltage max.	30 V DC / 50 V AC
Relay: Switching current max.	1.5 A
Relay: Switching power max.	45W, 75VA
Relay: Resistance (with connector)	125 m Ohm
Interface	RS232 C
Interface: Connection	D-sub-con. 9-pin, male
Interface: Typ	RS232 C asynchron
Interface: Baud rates	300 to 9600 baud
Interface: Data format	ASCII, 1 start, 8 Data bits, 1 Stop bit no Parity bit
Interface: Cable length max.	30 m
Weight	≈ 0.14 kg

ORDERING INFORMATION

Interface and Relay Board	IG441130-T
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ACCESSORIES

Mating connector, D-Sub, male, 9 poles	399-977
Mating connector, D-Sub, female, 15 poles for IF 300 A/C, relay output	399-973
Interface cable	
Relay connector complete	

Interface and Relay Board IF 300 P / IF 301 P

For TPG 500 Measuring systems

ProfiBus communication with control system and Set point relay outputs.



SPECIFICATION

	IF 300 P	IF 301 P
Relay Connector	D-sub 15 pin, male	D-sub 15 pin, male
Relay Numbers	4 mechanical relay for set point, 1 error relay all with change over contacts potential free.	4 photo MOS relay for set point, 1 error relay all with change over contacts potential free.
Max. applicable magnetic field	See TPG500	See TPG500
Relay: Switching voltage max.	30 V DC / 50 V AC	30 V DC / 50 V AC
Relay: Switching current max.	1.5 A	0.5 A
Relay: Switching power max.	45W, 75VA	25 VA
Relay: Resistance (with connector)	125 m Ohm	2.5 Ohm
Interface	ProfiBus-DP	ProfiBus-DP
Interface: Connection	D-sub-connector, 9-pin, male	D-sub-connector, 9-pin, male
Interface: Baud rates	9600, 19200	9600, 19200
Interface: Data format	ProfiBus protocols	ProfiBus protocols
Interface: Cable length max.	30 m	30 m
Weight	≈ 0.16 kg	≈ 0.15kg

ORDERING INFORMATION

Interface and Relay Board	IO441395	IO441396
Delivery time	2 weeks	2 weeks
ITER Status	Qualified for lab use only	In qualification

ACCESSORIES

Mating connector, D-Sub, male, 9 poles	IT941145	IT941145
Mating connector, D-Sub, female, 15 poles for IF 300 A/C, relay output	IT441129	IT441129

Pirani Gauge Head TPR 018

For TPG 500 measuring system

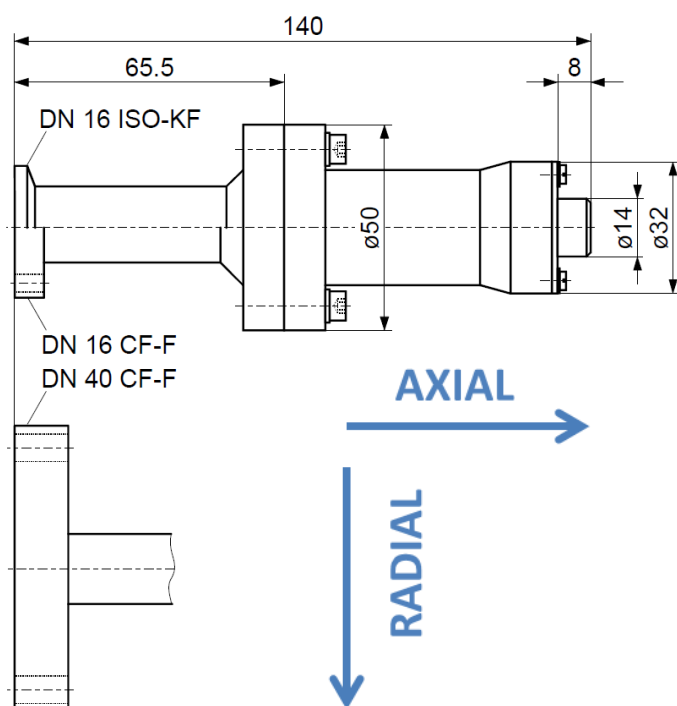
Bake able, magnetic field- and radiation-resistant

High Vacuum-compatible Gauge Head

Push & Pull connector



DIMENSIONS



SPECIFICATION

	TPR 018	TPR 018
Flange	DN 16 ISO-KF	DN 40 CF-F
Pressure range	$5 \times 10^{-4} \dots 1000 \text{ mbar}^{*3}$	
Operating temperature, high temperature sensor cable	0 to 120°C	
Operating temperature, standard sensor cable	0 to 80°C	
Bake-out temperature (with high temp. cable or without cable)	250°C	
Mechanical Integrity	300°C ^{*4}	
Radiation resistance	$1 \times 10^6 \text{ Gy}$	
Pressure deviation due to external magnetic field @ 10^{-2} mbar @ 1 mbar @ 10^2 mbar	Up to 480 mT: < 5% Up to 300 mT: < 2.5% Always positive ^{*5}	
Accuracy: at room temp. and cable length <20m	$\pm 10\%$ of reading in the range of $1 \times 10^{-2} \dots 100 \text{ mbar}$	
Accuracy: fully specified up to +70°C and within the pressure range and cable length	$\pm 20\%$ of reading in the range of $1 \times 10^{-2} \dots 100 \text{ mbar}$	
Accuracy: at 0 ... 120°C and specified cable length	$\pm 35\%$ of reading in the range of $1 \times 10^{-2} \dots 100 \text{ mbar}$	
Repeatability with air	$\pm 5\%$ of reading in the range of $1 \times 10^{-2} \dots 100 \text{ mbar}$	
Materials: Internal seal	Nimonic 90, Al	
Filament / holder	W/Ni	
Chamber wall, Housing feed through	St. Steel 1.4435, 1.4306	
Insulator	Al_2O_3	
Brazing both feed through vacuum atmosphere	Vacon 10, NiCo29-18 (0.379g Co) Vacon 10, NiCo29-18 (0.360g Co)	
Overpressure	$\leq 9 \text{ bar}$ (limited to inert gases)	
Protection category	IP 40	
Mounting orientation	We recommend mounting the gauge aligned with the magnetic field.	
Weight	0.6 kg	0.85 kg

ORDERING INFORMATION

Gauge	I0G15020	I0G15024
Optional with Material certificate	211-800	211-800
Delivery time	4 weeks	4 weeks
ITER Status	Qualified	Qualified

^{*3} Limited measurement and switching accuracy at pressures above 100 mbar and below 10^{-3} mbar

^{*4} Mechanical integrity, regarding vacuum tightness

^{*5} Tested to 3 dB margins as per Test method for ITER equipment for static (d.c.) magnetic fields (ITER D 98IL4W)

Cold Cathode Gauge Head IKR 084

For TPG 500 measuring system

Bakeable and radiation-resistant

High Vacuum Gauge Head

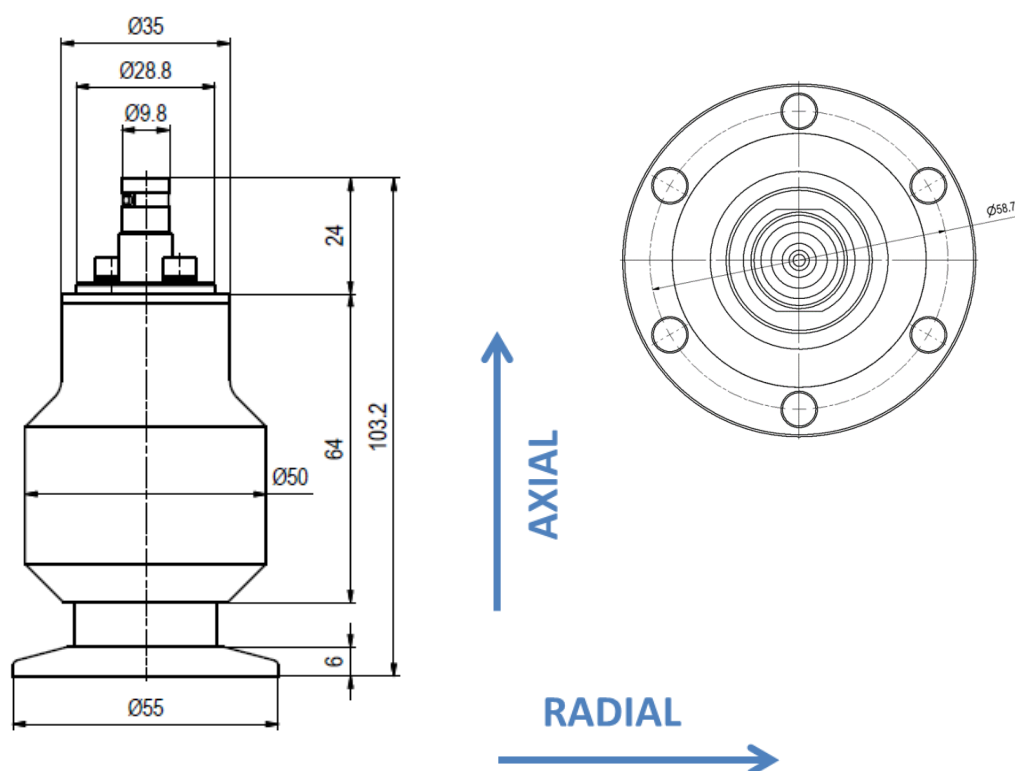
Magnetically fully shielded

Bayonet SHV connector for coaxial cable

Designed for use in double containment interior



DIMENSIONS



SPECIFICATION

	IKR 084	IKR 084
Flange	DN 40 ISO-KF	DN 40 CF-F
Display range	5x10 ⁻⁹ ... 1x10 ⁻² mbar	
Measurement range	1x10 ⁻⁸ ... 5x10 ⁻³ mbar	
Operating temperature, with normal cable	+5° C ... +80° C	
Operating temp., high temp. cable and Magnet	+5° C ... + 230° C	
Bake out temperature with -Magnet	230°C	
Mechanical Integrity	250°C	
Radiation resistance	1x10 ⁷ Gy	
Accuracy in measurement range at 25°C	Approx. ± 30%	
Max. external magnetic field, axial direction	180 mT (<10% deviation), 280 mT (< factor 2) * ⁶	
Max. external magnetic field, radial direction	150 mT (<10% deviation), 180 mT (< factor 2 dev.)* ⁶	
Fully reversible recovery from external magnetic field, any orientation*	Tested up to 600 mT	
Materials:		
Vacuum connection	St. steel (1.4306)	
Measuring chamber	St. steel (1.4306)	
Feed through isolation	Ceramic (Al ₂ O ₃)	
Anode	Molybdenum	
Ignition aid	St. steel (1.4330, 1.4435 ESU)	
Internal Vacuum Seal	Ni90, Ag plating	
Brazing feed through atm. vacuum	AU82Ni 950	
Ionization Chamber: wall, pole disks	St. steel (1.4301, 1.4016)	
Magnet	High Temperature NdFeB	
Magnetic protection shield	Fe 99.9% (soft iron) Ni electro plated (7 to10µm)	
Electrical connection (Connector/Type)	Bayonet SHV connector for coaxial cable	
Overpressure	≤ 9 bar, limited to gases and temp. <55° C	
Protection category	IP 40	
Weight	0.6 kg	0.85 kg

ORDERING INFORMATION

Gauge	IOG18770	IOG18771
with optional Material certificate 3.1	211-800	211-800
Delivery time	2 weeks	2 weeks
ITER Status	Qualified	Qualified

*⁶ Tested to 3 dB margins as per Test method for ITER equipment for static (d.c.) magnetic fields (ITER D 98IL4W)

Cold Cathode Gauge Head IKR 085

For TPG 500 measuring system

Bakeable and radiation resistant

High Vacuum Gauge Head

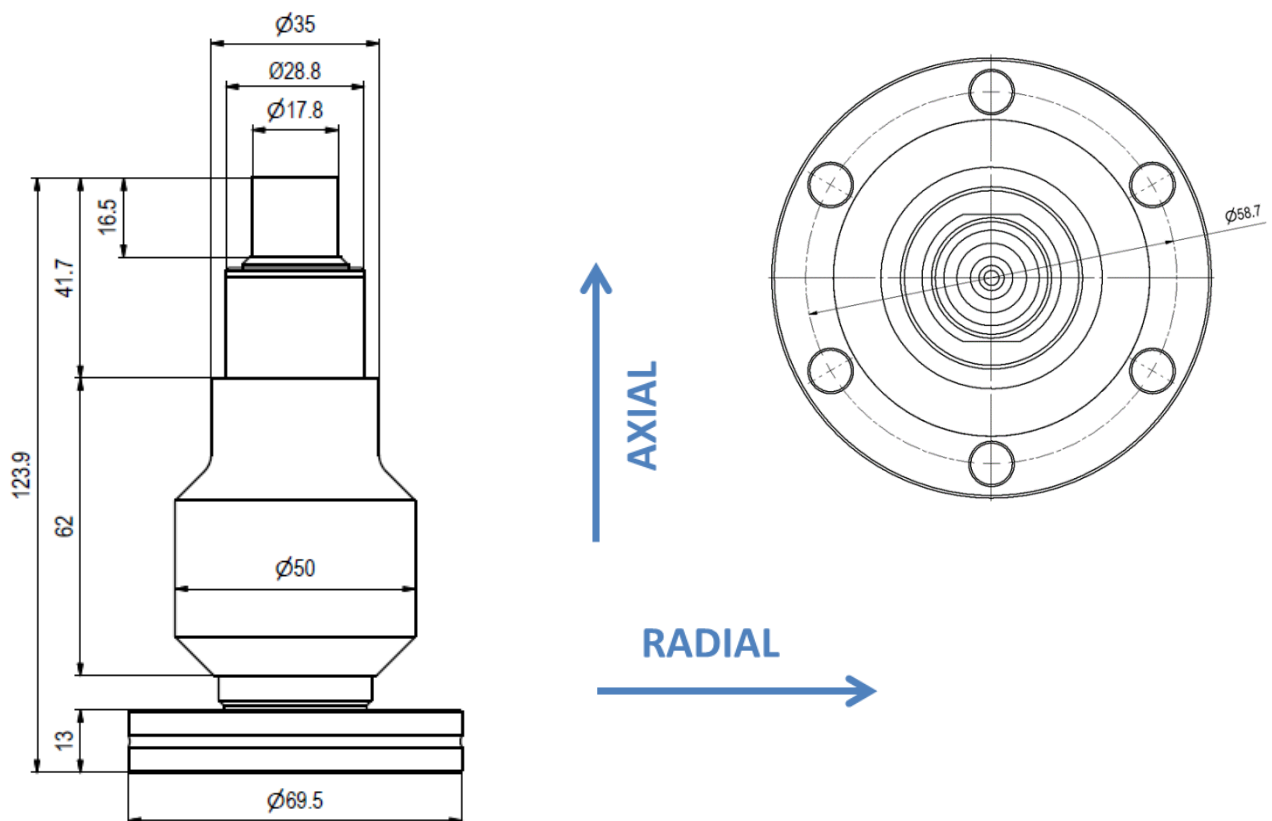
Magnetically fully shielded, triaxial connector

Push & Pull connector for coaxial cable

For use in moderate-radiation environments



DIMENSIONS



SPECIFICATION

	IKR 085	IKR 085
Flange	DN 40 ISO-KF	DN 40 CF-F
Display range	5x10 ⁻⁹ ... 1x10 ⁻² mbar	
Measurement range	1x10 ⁻⁸ ... 5x10 ⁻³ mbar	
Operating temperature, with normal cable	+5° C ... +80 °C	
Operating temp., high temp. cable and Magnet	+5° C ... + 230 °C	
Bake out temperature with Magnet	230 °C	
Mechanical Integrity	250 °C	
Radiation resistance	1x10 ⁷ Gy	
Accuracy in measurement range at 25°C	Approx. ± 30%	
Max. external magnetic field, axial direction	180 mT (<10% deviation), 280 mT (< factor 2) ^{*7}	
Max. external magnetic field, radial direction	150 mT (<10% deviation), 180 mT (< factor 2 dev.) ^{*7}	
Fully reversible recovery from external magnetic field, any orientation [*]	Tested up to 600 mT	
Materials:		
Vacuum connection	St. steel (1.4306)	
Measuring chamber	St. steel (1.4306)	
Feed through isolation	Ceramic (Al ₂ O ₃)	
Anode	Molybdenum	
Ignition aid	St. steel (1.4330, 1.4435 ESU)	
Internal Vacuum Seal	Ni90, Ag plating	
Brazing feed through atm. vacuum	AU82Ni 950	
Ionization Chamber: wall, pole disks	St. steel (1.4301, 1.4016)	
Magnet	High Temperature NdFeB	
Magnetic protection shield	Fe 99.9% (soft iron) Ni electro plated (7 to10µm)	
Electrical connection (Connector/Type)	Triaxial connector (used as coax) and SHV cable connector	
Overpressure	≤ 9 bar, limited to gases and temp. <55° C	
Protection category	IP 40	
Weight	0.6 kg	0.85 kg

ORDERING INFORMATION

Gauge	I0G18772	I0G18773
with optional Material certificate 3.1	211-800	211-800
Delivery time	2 weeks	2 weeks
ITER Status	Qualified	Qualified

^{*7} Tested to 3 dB margins as per Test method for ITER equipment for static (d.c.) magnetic fields (ITER D 98IL4W)

Cold Cathode Gauge Head IKR 086

For TPG 500 measuring system

Bakeable and radiation-resistant

High Vacuum Gauge Head

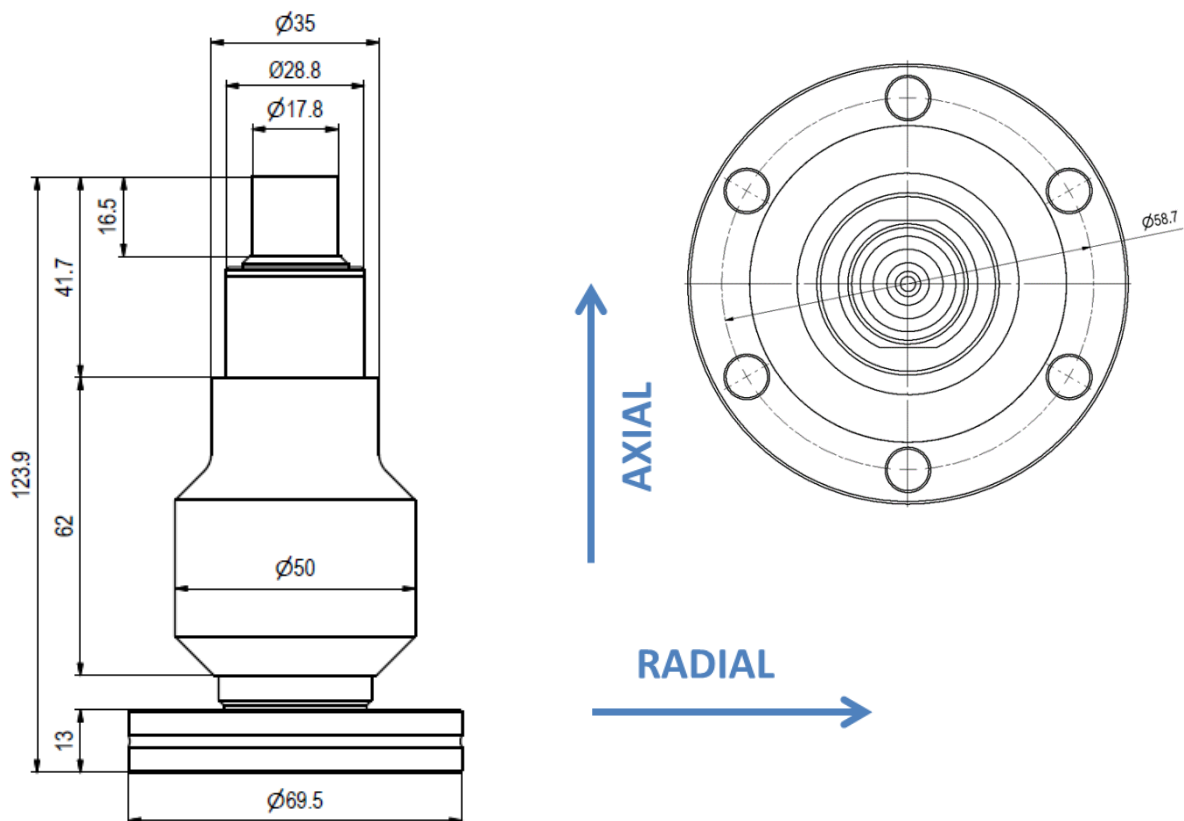
Magnetically fully shielded, triaxial connector

Push & Pull connector for triaxial cable

For locations requiring long-distance cabling



DIMENSIONS



SPECIFICATION

	IKR 086	IKR 086
Flange	DN 40 ISO-KF	DN 40 CF-F
Display range	$1 \times 10^{-9} \dots 1 \times 10^{-2}$ mbar	
Measurement range	$1 \times 10^{-8} \dots 5 \times 10^{-3}$ mbar	
Operating temperature, with normal cable	+5 °C ... +80 °C	
Operating temp., high temp. cable and Magnet	+5 °C ... + 230 °C	
Bake out temperature with -Magnet	230 °C	
Mechanical Integrity	250 °C	
Radiation resistance	1×10^7 Gy	
Accuracy in measurement range at 25°C	Approx. $\pm 30\%$	
Max. external magnetic field, axial direction	180 mT (<10% deviation), 280 mT (< factor 2) *8	
Max. external magnetic field, radial direction	150 mT (<10% deviation), 180 mT (< factor 2) *8	
Fully reversible recovery from external magnetic field, any orientation*	Tested up to 600 mT	
Materials:	Vacuum connection	St. steel (1.4306)
	Measuring chamber	St. steel (1.4306)
	Feed through isolation	Ceramic (Al ₂ O ₃)
	Anode	Mo
	Ignition aid	St. steel (1.4330)
	Internal vacuum seal	Ni90, Ag plating
	Brazing feed through atm. vacuum	AU82Ni 950
	Ionization Chamber : (Wall + pole disks)	St. steel (1.4301, 1.4016)
	Magnet	High Temperature NdFeB
	Magnetic protection shield	Fe 99.9% (soft iron) Ni electro plated (7 to 10µm)
Electrical connection (Connector/Type)	Triaxial connector on gauge and controller	
Overpressure	≤ 9 bar, limited to gases and temp. <55 °C	
Protection category	IP 40	
Weight	0.6 kg	0.85 kg

ORDERING INFORMATION

Gauge	I0G18776	I0G18777
with optional Material certificate 3.1	211-800	211-800
Delivery time	2 weeks	2 weeks
ITER Status	In qualification	In qualification

*8 Tested to 3 dB margins as per Test method for ITER equipment for static (d.c.) magnetic fields (ITER D 98IL4W)

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