

Sensoflex - Incremental SFI-plus

Operating Instructions

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding






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Explanation of Symbols and Notes

Notes which are highlighted by these symbols help to prevent injury to personnel. Please ensure that all users understand them.

Symbol	Explanation of Symbol
	Attention: This symbol is used if failure to comply carefully with operating instructions, operating sequences, etc. can lead to persons injuries, fatal accidents or damage to the plant.
	Information: Symbol for tips and notes to facilitate use of machine and to help to prevent damage.
	Attention: Danger of crushing

1 Foreword to the Operating Instructions

The purpose of these Operating Instructions is to assist you in familiarising yourself with the SFI-plus and to make use of the functions it has been designed for.

The Operating Instructions contain important advice so that you can use the SFI-plus safely, reliably and economically. Observance of these Operating Instructions will help you to avoid danger, reduce repair costs and downtime as well as to increase reliability and the service life of the SFI-plus.

These Operating Instructions need to be read and applied by all persons working with the SFI-plus, including:

- operating the unit, including setup work, trouble shooting during the work sequence, removal of production waste, servicing, handling as well as removing waste of hazardous materials (operating and auxiliary materials);
- maintenance (preventive maintenance, inspection, repairs).

In addition to the Operating Instructions and the mandatory regulations for accident prevention and environmental protection applicable in the user country and at the location of deployment, the standard technical rules and regulations for safe and professional work shall also be observed.

User's Responsibilities

The following is assumed to be the operator's/organisation's responsibility:

- compliance with EN 89/655 and the national applications
- compliance with the applicable national regulations for safety at work
- authorized use of SFI-plus
- correct applications of these operating instructions.

Commissioning of the OSP-P is forbidden until it has been established that the machine/plant in which it is to be installed complies with the requirements of the EC Machines Directives.

Copyright

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They must not be copied in full or in part, distributed or used in an unauthorized manner for competitive purposes or passed on to others. Contravention may lead to legal action.

Produkt Monitoring

Our goal is to supply safe, state-of-the-art products. Therefore we monitor our products constantly after delivery. Please inform us immediately of any recurring malfunctions or problems with the SFI-plus.

2 Safety

The equipment has been constructed in accordance with state-of-the-art technology and current regulations. Special emphasis has been placed on the safety of operators. This has been confirmed in the manufacturer's statement.

In addition, all relevant rules and regulations apply as a matter of course, such as the applicable regulations for health and safety at work, generally accepted rules for the safe operation of machinery, the EU Directives, any special regulations of the respective country/state as well as any other relevant standards.

Authorized Use

The SFI-plus length measuring system has been designed exclusively for general distance measuring for industrial purposes, especially for determining the location of cylinder pistons and attached components. It may be suitable for other, similar measuring tasks.

Any applications beyond the above description are considered not in accordance with the design purpose. The manufacturer does not accept any liability for any damage resulting from such use and any associated risk must be borne by the user. As the SFI-plus can be used in a variety of applications, the responsibility for its specific application passes over to the user when such use commences.

Personnel

The SFI-plus has been constructed in accordance with state-of-the-art technology and the recognised safety rules and regulations. Nevertheless, it is possible that risks arise during the application of the equipment. For this reason, the units may only be fitted and operated by competent and trained personnel and only be deployed in accordance with the intended purpose. All persons involved in the fitting, operation, servicing, repair or dismantling of SFI-plus must have read and understood these operating instructions and in particular the section on 'Safety' of the operating instructions for OSP and/or similar drives or linear axes.

Conversions and alterations



The SFI-plus shall not be modified in its construction and safety aspects, without the prior written approval of **Parker Hannifin GmbH**. Any such modifications carried out without approval will rule out all liability on the part of **Parker Hannifin GmbH**.

The replacement of spare parts may only be carried out after consultation with our service technicians or by these technicians themselves. On principle, it is not permitted to take off or de-activate any safety or protection devices.

When installing special attachments, the assembly regulations of the manufacturer shall be observed as required.

The following regulatory instruments must be observed as a matter of course:

- relevant rules and regulations for accident prevention,
- generally recognised safety regulations,
- EU-Directives and
- country-specific provisions.

3 Warranty

We reserve the right to make alterations to these Operating Instructions as well as to technical details with reference to data and illustrations as contained in these Operating Instructions.

Parker Hannifin GmbH issues no quality and durability guarantees or any guarantees for the suitability for certain purposes unless these are expressly agreed in writing.

Public statements, statements of quality or advertising are not statements of characteristics.

If the user wants to make a claim under the warranty, he needs to notify the fault immediately and describe it precisely in his statement of complaint. Under no circumstances is

Parker Hannifin GmbH responsible for damage to the product itself or for consequential

damage caused by the product, as caused by incorrect and faulty handling of the product. Insofar as **Parker Hannifin GmbH** is responsible for a fault, **Parker Hannifin GmbH** may, at its discretion, either repair/modify the product or replace the item with a new one.

All SFI-plus are provided with an identification plate within the framework of ISO 9000, that is attached to an OSP-P. This identification plate shall not be removed or destroyed in any way.

A liability of Messrs **Parker Hannifin GmbH** – irrespective of the legal reason – exists only in the event of intentional or gross negligence, culpable injury to life, body, health, in the event of deficiencies with malicious intent of deception or faults the absence of which has been expressly guaranteed.

Furthermore, the company is liable to the extent stipulated by the product liability law regarding personal injury or material damage on objects used privately. In the event of culpable violation of essential contractual obligations, **Parker Hannifin GmbH** is liable also in the case of minor negligence, however, limited to the damage that could be foreseen under the contract.

Any other claims are ruled out.

No warranty shall apply in the event of non-observance of these Operating Instructions, the relevant legal provisions as well as further instructions of the supplier.

In particular, we are not responsible for stoppages caused by modifications by the customer or other persons. In such cases, we charge the normal repair costs. These are also charged for an inspection of the equipment where no fault can be found on the equipment.

This regulation also applies during the warranty period.

Users have no rights regarding the supply of previous equipment versions or regarding the upgrading of equipment to the current version.

The right to introduce technical modifications is reserved.

4 Transport and Assembly



Transport damage and missing parts are to be reported immediately and in writing to the transport company or to **Parker Hannifin GmbH** or to the delivery company.

Any intermediate storage must not be outside but in dry, dust-free rooms that are free from vibrations.

Storage temperature -25° to $+85^{\circ}$ C.

5 After sales service

Spare parts and after sales service addresses

Refer to the last page of these Operating Instructions.

Spare parts list

For the purposes of preventive maintenance for the linear drives, we offer seal kit sets, service packages and spare parts (refer to Chapter 12 page 15).

Please observe our homepage: www.origa-service.com

6 Technical description

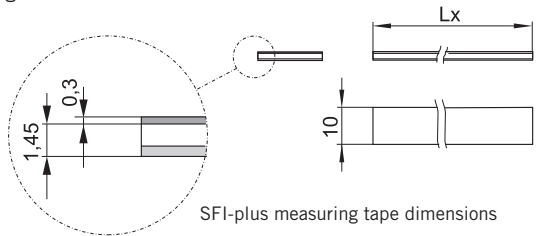
6.1 Technical data

The SFI-plus consists of a reading head with integrated electronic evaluation system and a magnetic measuring tape. The reading head records the position while being moved across the measuring tape.

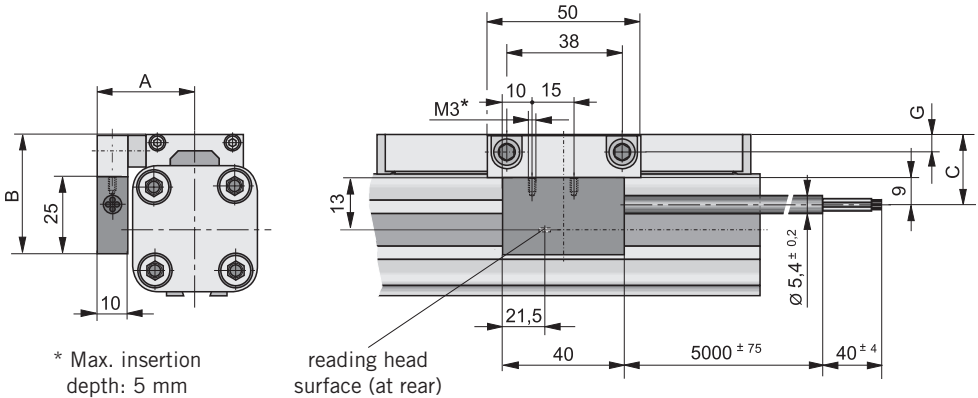
It can only operate with the correct measuring tape for this system. It can be installed in any position. SFI-plus measuring tape dimensions For further information about application options please refer to the catalogue.

A type plate with CE symbol is affixed to the side of the reading head that faces away from the measuring tape and carries the following data:

- Identification number and type designation
- Year of manufacture



Dimensions for installation



Cylinder	A	B	C	G
OSP-P 25	31	43	23	5.5
OSP-P 32	37	50	30	6.5
OSP-P 40	42	54	34	6.5
OSP-P 50	49	59	39	6.5
OSP-P 63	59	73	49	10
OSP-P 80	72	90	64	12

6.2 Data and properties

Output function	Id.-Nr. 21210FIL	Id.-Nr. 21211FIL
Resolution	0.1 mm	1 mm
Pole length magnetic scale	5 mm	
Maximum speed	10 m/sec.	
Repeat accuracy	± 1 increment	
Distance between sensor and scale	< 2 mm	
Tangential deviation	≤ 3° / ≤ 1°	
Lateral deviation	≤ ± 1.5 mm	
Switching output	Push-Pull	
Electrical properties		
Operating voltage U_b	10 ... 30 V DC	
Voltage drop	≤ 2 V	
Continuous current for each output	≤ 40 mA	
Power consumption at $U_b = 24$ V, switched on, without load	≤ 15 mA	
Short-circuit protection	yes	
Reverse polarity protection	yes	
Protection for inductive load	yes	
EMC - compatibility	yes	
Mechanical properties		
Connecting cable	PUR: 2x 0.14 mm ² + 2x 0.22 mm ² , black	
Cable length	5 m, casted, flying lead	
Bending radius, moving	≥ 50 mm	
Housing material	Aluminium	
Weight	ca. 0.165 kg	
Ambient conditions		
Enclosure rating to EN 60529	IP67	
Ambient temperature range	-25 ... +85 °C	
Vibration in accordance with EN 60068-2-6	55 Hz...2 kHz, 300 m/s ²	
Shock to EN 60068-2-27	11 ms, 300 m/s ²	

7 Installation and fitting

7.1 Functional safety notes



Please observe the notes in the catalogue and/or in the operating instructions of the respective pneumatic unit / drive axle for instructions relating to mechanical fitting.

The fitting must always be carried out in such a way that the relevant regulations are complied with; the electric installation must comply with the following notes in accordance with EMC regulations:

- The cable between the reading head and the downstream electronics should not be longer than necessary.
- Only use screened cable, if possible twisted.
- All signal cables should be installed at the maximum possible distance to cables that are subject to faults, such as drive cable, inverter cable etc.
- Where appropriate, standard EMC filters should be fitted to the cable for the operating voltage of the reading head.
- The reading head should be installed with the maximum possible distance to drives, inverters etc. or protected from these with screening baffles if required.

All connections and operating parts must be accessible and the type plate in a readable position.



Any sources of danger existing between Parker Hannifin products and customer equipment are to be eliminated by the user or to be made secure.

7.2 General

Where the SFI-plus has not already been fitted to a drive unit by **Parker Hannifin**, the following should be observed:

The minimum and maximum permitted distance between reading head and measuring tape must not be exceeded in either direction at any time during the movement. The guide mechanism needs to be designed accordingly (see also page 10).

Reading head

The SFI-plus may only be installed in accordance with the specified type of protection (IP67). In addition, the reading head should be protected against impact, friction, solvents and temperatures below -25° and above $+85^{\circ}$ C.

Measuring tape

For technical reasons, the measuring tape has to be longer than the measured distance by approximately 10 mm on both sides. The measuring tape is supplied in rolls at certain lengths (unless already installed).

A metallic pair of scissors can be used to cut the measuring tape to the length required for the distance to be measured.



Avoid direct contact of measuring tape to magnets!

7.3 Fixing the measuring tape

The measuring tape is to be fixed to the OSP exclusively in the dovetail groove of the cylinder tube or drive profile.

For other applications (linear drives, mech. or elt. axles etc.) the fixing should be similarly, as required by the situation.

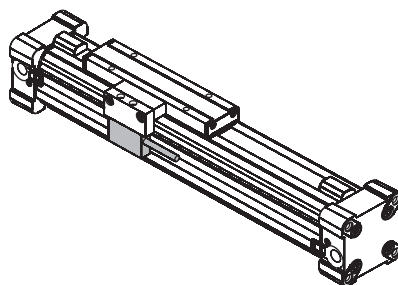


Attention!

The active side of the measuring tape must be facing the active side of the reading head (opposite the type plate).

This simple fitting method can only be recommended in a relatively protected environment. Otherwise there is a risk of the bonding to become detached. If necessary, suitable commercially available adhesives can be used.

Arrangement of reading head and fixing of measuring tape, bonded with self-adhesive tape



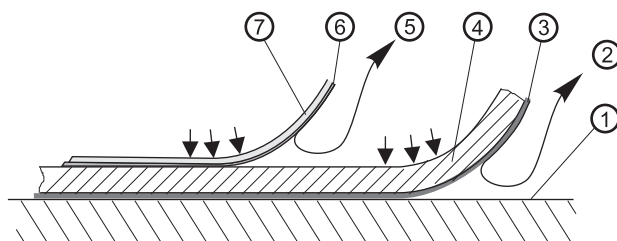
Fitting steps:



Attention!

In order to achieve optimum adhesion it is necessary to remove all foreign substances, such as oil, grease, dust etc. Use cleansing agents that do not leave a residue, such as acetone or alcohol. Ideally, the measuring tape should be glued into place at a temperature between 20° and 30° C.

- Clean the fitting surface (1) thoroughly (degreasing) and optionally mark the linear position, after aligning it well.
- The measuring tape (4) is supplied with double-sided adhesive tape (3).
- Remove protective film (2).
- Apply measuring tape (4) with double-sided self-adhesive tape to the mounting surface (1).
- The stainless steel protective tape (7) comes with a double-sided self-adhesive tape (6).
- Remove protective film (5).
- Apply stainless steel tape (7) to the brown side of the measuring tape (4).



Process of attaching the tape

7.4 Fitting the reading head

The mechanical configuration and fitting angle need to comply with the specified tolerances between the reading head and the measuring tape for the whole length of travel:



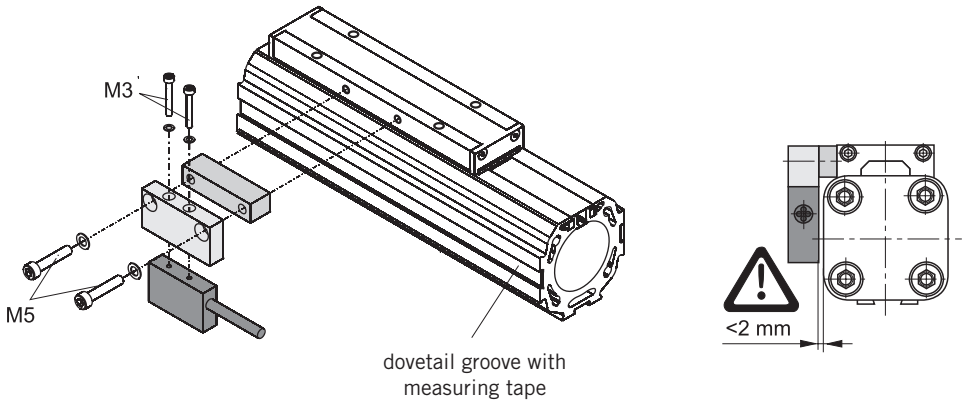
max. distance < 2 mm !

The reading head must not come in contact with the measuring tape.

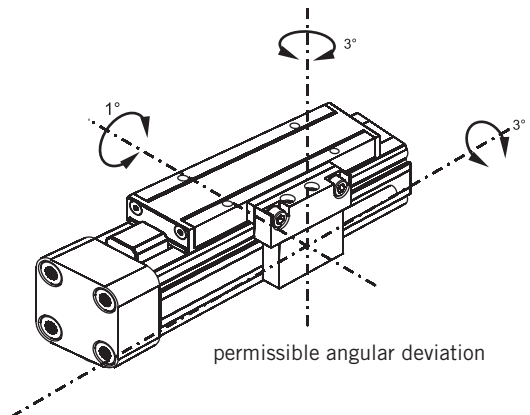
The reading head is fitted to the OSP cylinder series with the appropriate connection sets (see also the drawing of individual spare parts on page 15).

- Attach the reading head with two M3 screws (insertion depth max. 5 mm) and adjust if necessary.
- Please take note of the permissible angular deviation (see drawing below).

For further technical data and tolerances please refer to page 7.



Torque for tightening screws		
M3	1.2 Nm	± 0.2 Nm
M5	5.5 Nm	± 0.8 Nm



8 Electrical connection

8.1 Output signals

The electronic evaluation device (PLC, fast counter) records the signal received from the reading head and evaluates them. Different evaluation procedures can be used for different measurement resolutions. As with incremental shaft encoders the measurement signals are issued as AB signal.

Signal process – reading head output

U_a = U_e	Phase B	U_{a1}	0°	
	Phase A	U_{a2}	90°	

The preset resolution (after 4-fold evaluation) and the respective output has been fixed for all reading heads as follows:

SFI-plus Id. no.21210FIL resolution 0.1 mm

SFI-plus Id. no.21211FIL resolution 1 mm

The reading head issues 2 rectangular signals in quadrature with U_b – 2 V.

Note regarding impulse frequency:



The pole distance of the magnetic measuring tape is 5 mm. The generation of impulse depends on the type of SFI-plus used.

With increasing operating speed the output frequency of the signal impulses increases proportionally. This requires the cycle frequency of the downstream counting input to be adjusted accordingly.

position measuring system	resolution [mm]	speed [m/sec]	output frequency [kHz]
SFI-plus 21210FIL	0.1	1	10
SFI-plus 21211FIL	1	1	1

8.2 Connection, cable assignment

The connection cable should be installed mechanically secure, e.g. via energy chain and in metal cable ducting for signal lines.

Avoid chafing of cables.

Electrical connection	
colour	function
red (RD)	10 ... 30 VDC
black (BK)	ground
yellow (YE)	signal A
green (GN)	signal B
shield	shielding

IMPORTANT:



- All wiring to be carried out with the power disconnected.
- The cable screening and GND (0 V) to be connected with large cross-section in order to ensure that the impedance is as low as possible.
- The cable between the reading head and the downstream electronic device depending on counting frequency:
 - 30 m at counting frequency of 25 kHz
 - 20 m at counting frequency of 50 kHz
 - 10 m at counting frequency of 100 kHz
- Check all electrical connections before commissioning and starting up the system.
- For the installation also take note of the safety notes on page 3.

8.3 Commissioning

- Before switching the system ON, install and check the associated switches and connections to the downstream electronic device.

Danger of injuries



Automatic operation entails a risk of trapping and injury of limbs.

- First disconnect the power from the device.
- Move the unit with the reading head manually and check the counting mechanism.
- Also check the reference switch and possibly also the limit switch for functionality and firm installation.



For closing the unit down, decommissioning and/or recommissioning observe the general rules for technical apparatus.

9 Service

The system is maintenance-free. Nevertheless we recommend that the following points are observed in order to ensure the best possible functionality and service life:

- Check the fitting tolerances between the reading head and measuring tape along the whole length of the measured distance (check for straightness and looseness in the guide)
- Clean the measuring tape surface when dirty (e.g. due to magnetic metal dust, chips)
- Check the condition of the connection cable (indication of broken cable, areas of chafing or trapping)



Any cleaning should only be carried out using substances free from solvent and lint-free cloths!

10 Troubleshooting

Typical faults that may occur during the installation or commissioning:

Fault	Possible cause	Remedy
No impulses are issued. Signal A, B is missing. The measuring system does not count.	No power supply.	Connect power supply.
	Signal line mixed up.	Correct wiring installation.
	Programming error.	Check inputs and eliminate errors.
	The protective film for the measuring tape is not suitable.	The covering film must be antimagnetic.
	The tolerance for the distance between the reading head and the measuring tape is too large over the whole length.	For the distance tolerance refer to technical data on page 10.
	Reading head touches the measuring tape and is damaged.	Order new reading head and replace the damaged one.
	Reading head damaged due to wrong electrical connection (back voltage on output lines).	Correct wiring layout, order new reading head and replace the damaged one.
Measuring error.	The fitting tolerance has not been maintained over the whole measured length.	For tolerances refer to technical data on page 10.
	Faults have an impact on the measured result.	Eliminate on of faults - see chapter 'IMPORTANT' on page 12.
	External magnetic fields.	Elimination of magnetic fields.
Direction of counting-wrong.	Signal wiring mixed up.	Correct the wiring.

11 EC Conformity Statement



Parker Hannifin Manufacturing Germany GmbH & Co. KG
Pneumatic Division Europe – Origa
Industriestraße 8
70794 Filderstadt (Sielmingen)
Deutschland

Tel +49 (0)7158 1703-0
Fax +49 (0)7158 64870
info-origa-de@parker.com

www.parker-origa.com
www.parker.com

Ust.-Id.-Nr.: DE 277325745
Steuer-Nr. 349/5747/2105

Commerzbank AG
BLZ: 480 400 35
Konto: 7810371
IBAN: DE14 4804 0035 0761 0371 00
SWIFT: COBADEFF480

EC Conformity Statement

Following the meaning of EC Directive EMC 2004/108/EC we, the company bringing this equipment to the market, state in full responsibility that

the SFI-plus length measuring system

complies with the fundamental requirements.

The following related standards apply:

EN 61000-6-4

EN 61000-6-2

Company: **Parker Hannifin Manufacturing Germany GmbH & Co. KG**
Pneumatic Division Europe – Origa
Industriestraße 8 · 70794 Filderstadt (Sielmingen)

This product has been developed and produced for determining the position or measuring the length with linear cylinders without piston rods or similar drive and mechanical units.

Filderstadt, December 2013


ppa. Johann Asperger


ppa. Denis Eckstein

12 Replacement Parts

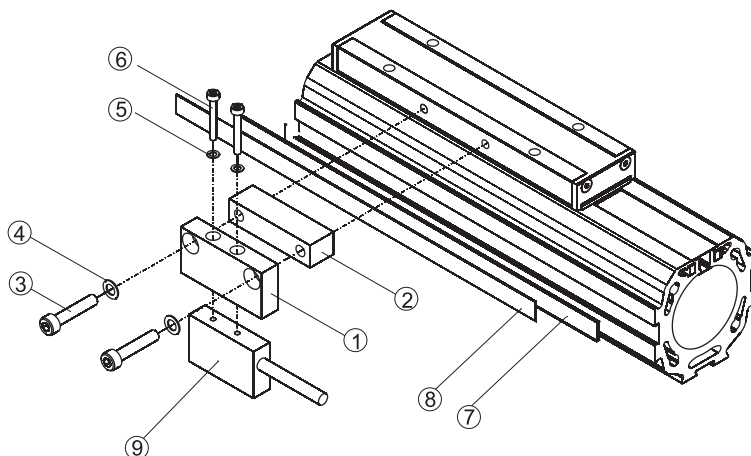
ITEM.	DESCRIPTION	IDENT-NO. * (**)					
		Ø 25	Ø 32	Ø 40	Ø 50	Ø 63	Ø 80
7,8,9	READING HEAD WITH MEASURING TAPE, RESOLUTION 0.1 MM (PLEASE INDICATE LENGTH OF MEASURING TAPE) **	21240	21240	21240	21240	21240	21240
7,8,9	READING HEAD WITH MEASURING TAPE, RESOLUTION 1.0 MM (PLEASE INDICATE LENGTH OF MEASURING TAPE) **	21241	21241	21241	21241	21241	21241
9	READING HEAD WITHOUT MEASURING TAPE, RESOLUTION 0.1 MM	21210	21210	21210	21210	21210	21210
9	READING HEAD WITHOUT MEASURING TAPE, RESOLUTION 1.0 MM	21211	21211	21211	21211	21211	21211
7,8	MEASURING TAPE PER METER	21235	21235	21235	21235	21235	21235
1,2,3,4, 5,6	CONNECTION SET FOR OSP-P	21213	21214	21215	21216	21217	21218

* Please use this order pattern: IDENT-NO. + „FIL“, example: 21210FIL

** Please use this order pattern: IDENT-Nr. + „measuring tape length in mm“ (5 digits)

Example:

Reading head with measuring tape , Resolution 0.1mm, Measuring tape length 1000mm: 21240-01000



13 Removal / Disposal



Observe all regulations on the disposal of environmentally damaging materials.

Sales Offices Worldwide

Europe, Middle East, Africa

AE – United Arab Emirates, Dubai
Tel: +971 4 8127100
parker.me@parker.com

AT – Austria, Wiener Neustadt
Tel: +43 (0)2622 23501-0
parker.austria@parker.com

AT – Eastern Europe, Wiener Neustadt
Tel: +43 (0)2622 23501 900
parker.easteurope@parker.com

AZ – Azerbaijan, Baku
Tel: +994 50 2233 458
parker.azerbaijan@parker.com

BE/LU – Belgium, Nivelles
Tel: +32 (0)67 280 900
parker.belgium@parker.com

BG – Bulgaria, Sofia
Tel: +359 2 980 1344
parker.bulgaria@parker.com

BY – Belarus, Minsk
Tel: +375 17 209 9399
parker.belarus@parker.com

CH – Switzerland, Etoy
Tel: +41 (0)21 821 87 00
parker.switzerland@parker.com

CZ – Czech Republic, Klecany
Tel: +420 284 083 111
parker.czechrepublic@parker.com

DE – Germany, Kaarst
Tel: +49 (0)2131 4016 0
parker.germany@parker.com

DK – Denmark, Ballerup
Tel: +45 43 56 04 00
parker.denmark@parker.com

ES – Spain, Madrid
Tel: +34 902 330 001
parker.spain@parker.com

FI – Finland, Vantaa
Tel: +358 (0)20 753 2500
parker.finland@parker.com

FR – France, Contamine s/Arve
Tel: +33 (0)4 50 25 80 25
parker.france@parker.com

GR – Greece, Athens
Tel: +30 210 933 6450
parker.greece@parker.com

HU – Hungary, Budaörs
Tel: +36 23 885 470
parker.hungary@parker.com

IE – Ireland, Dublin
Tel: +353 (0)1 466 6370
parker.ireland@parker.com

IT – Italy, Corsico (MI)
Tel: +39 02 45 19 21
parker.italy@parker.com

KZ – Kazakhstan, Almaty
Tel: +7 7273 561 000
parker.easteurope@parker.com

NL – The Netherlands, Oldenzaal
Tel: +31 (0)541 585 000
parker.nl@parker.com

NO – Norway, Asker
Tel: +47 66 75 34 00
parker.norway@parker.com

PL – Poland, Warsaw
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

PT – Portugal, Leca da Palmeira
Tel: +351 22 999 7360
parker.portugal@parker.com

RO – Romania, Bucharest
Tel: +40 21 252 1382
parker.romania@parker.com

RU – Russia, Moscow
Tel: +7 495 645-2156
parker.russia@parker.com

SE – Sweden, Spånga
Tel: +46 (0)8 59 79 50 00
parker.sweden@parker.com

SK – Slovakia, Banská Bystrica
Tel: +421 484 162 252
parker.slovakia@parker.com

SL – Slovenia, Novo Mesto
Tel: +386 7 337 6650
parker.slovenia@parker.com

TR – Turkey, Istanbul
Tel: +90 216 4997081
parker.turkey@parker.com

UA – Ukraine, Kiev
Tel: +380 44 494 2731
parker.ukraine@parker.com

UK – United Kingdom, Warwick
Tel: +44 (0)1926 317 878
parker.uk@parker.com

ZA – South Africa, Kempton Park
Tel: +27 (0)11 961 0700
parker.southafrica@parker.com

North America

CA – Canada, Milton, Ontario
Tel: +1 905 693 3000

US – USA, Cleveland
Tel: +1 216 896 3000

Asia Pacific

AU – Australia, Castle Hill
Tel: +61 (0)2-9634 7777

CN – China, Shanghai
Tel: +86 21 2899 5000

HK – Hong Kong
Tel: +852 2428 8008

IN – India, Mumbai
Tel: +91 22 6513 7081-85

JP – Japan, Tokyo
Tel: +81 (0)3 6408 3901

KR – South Korea, Seoul
Tel: +82 2 559 0400

MY – Malaysia, Shah Alam
Tel: +60 3 7849 0800

NZ – New Zealand, Mt Wellington
Tel: +64 9 574 1744

SG – Singapore
Tel: +65 6887 6300

TH – Thailand, Bangkok
Tel: +662 186 7000-99

TW – Taiwan, Taipei
Tel: +886 2 2298 8987

South America

AR – Argentina, Buenos Aires
Tel: +54 3327 44 4129

BR – Brazil, Sao Jose dos Campos
Tel: +55 800 727 5374

CL – Chile, Santiago
Tel: +56 2 623 1216

MX – Mexico, Toluca
Tel: +52 72 2275 4200

European Product Information

Centre

Free phone: 00 800 27 27 5374

(from AT, BE, CH, CZ, DE, DK, EE, ES, FI, FR, IE, IL, IS, IT, LU, MT, NL, NO, PL, PT, RU, SE, SK, UK, ZA)

Parker Hannifin Manufacturing Germany GmbH & Co. KG
Pneumatic Division Europe – Origa

Industriestraße 8
70794 Filderstadt, Germany
Tel: +49 (0)7158 1703-0
Fax: +49 (0)7158 64870
E-Mail: info-origa-de@parker.com
www.parker-origa.com
www.parker.com

