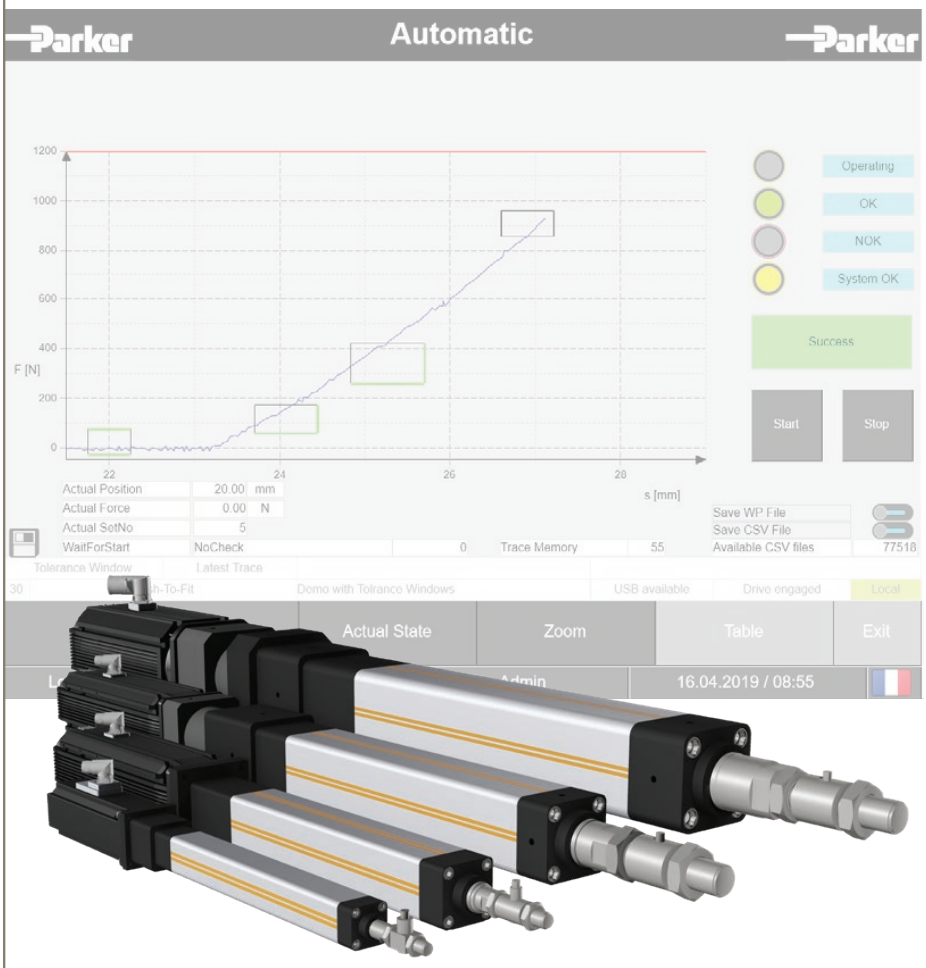
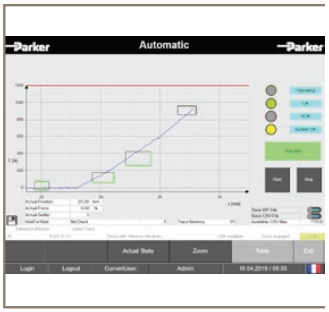


Push-To-Fit

Solutions for press and joining applications



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Push-To-Fit - PTF

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Parker Hannifin

The global leader in motion and control technologies

A world class player on a local stage

Global Product Design

Parker Hannifin has more than 40 years experience in the design and manufacturing of drives, controls, motors and mechanical products. With dedicated global product development teams, Parker draws on industry-leading technological leadership and experience from engineering teams in Europe, North America and Asia.

Local Application Expertise

Parker has local engineering resources committed to adapting and applying our current products and technologies to best fit our customers' needs.

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Parker is committed to meeting the increasing service demands that our customers require to succeed in the global industrial market. Parker's manufacturing teams seek continuous improvement through the implementation of lean manufacturing methods throughout the process. We measure ourselves on meeting our customers' expectations of quality and delivery, not just our own. In order to meet these expectations, Parker operates and continues to invest in our manufacturing facilities in Europe, North America and Asia.

Electromechanical Worldwide Manufacturing Locations

Europe
Littlehampton, United Kingdom
Dijon, France
Offenburg, Germany
Filderstadt, Germany
Milan, Italy

Asia
Wuxi, China
Jangan, Korea
Chennai, India

North America
Rohnert Park, California
Irwin, Pennsylvania
Charlotte, North Carolina
New Ulm, Minnesota

Offenburg, Germany

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Milan, Italy

Littlehampton, UK

Filderstadt, Germany

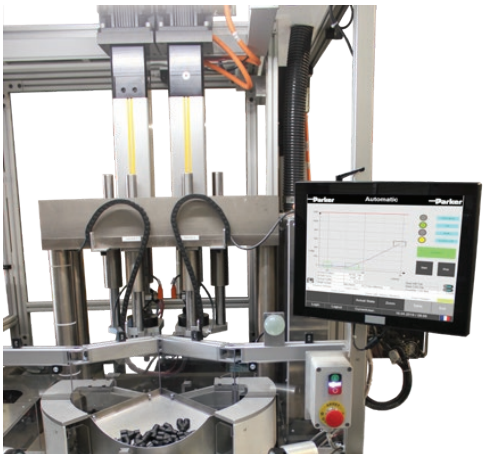
Dijon, France

Push-To-Fit - PTF

Overview

Description

Push-To-Fit is an electromechanical solution for servo presses and joining applications, the key processes in modern automated manufacturing. Combining its established core products into a joining module, Parker offers a reliable, energy efficient and cost-effective solution to serve customers critical applications in harsh industrial environments. All single components of the PTF module are designed to fulfill highest expectations concerning force, dynamic, precision and service life.



Advantages

Energy savings

- Electromechanical offers greater efficiency in comparison to other technologies such as hydraulics and pneumatics
- Quiet, clean and energy saving technology

Excellent throughput rates

- Thanks to high travel speed up to 450mm/s

Quick and easy integration

- A wide range of Ethernet based fieldbuses
- Ease of use
- Parker's established and reliable core products
- Short delivery time

Cost-effective and highly flexible solution

- Different thrust forces
- Multiple stroke length
- Functional safety
- You only buy what you need

Functional Safety

- Hardware STO as standard
- Safety PLC with STO over FSoE and functions like SS1, SLS, SBC and SBT
- External safety brake

Markets

- General Industrial Assembly
- In-Plant Automotive (gearbox assembly, motor assembly, ...)

Technical Characteristics - Overview

Modules	PTF009 / PTF025 / PTF056 / PTF114
Max. dynamic. traction/thrust force	up to 114 kN
Max. stroke	up to 600 mm
Max. travel speed	up to 450 mm/s
Max. acceleration	up to 8.5 m/s^2
Repeatability	+/- 0.03 mm
Motion profile	up to 20 instructions
Tolerance band	50 points per limit (upper / lower)
Tolerance window	5 windows per workpiece and 11 different types
Program cycle time	1 ms
Measuring samples per motion profile	up to 2000
Sampling time	1 ms to 30 ms
Number of different workpieces	500
Internal curve storage per workpiece	500

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Description

Parker HMI

- Simplify and reduce cost in visualisation applications.
- Designed to optimize performance, storage and connectivity.
- Compact, no fan – no maintenance
- Brilliant display and low power consumption
- High resolution touch screen with 10“ or 15“
- Sealed / protected against dust, dirt, and splash water (front side)
- System integration via Ethernet
- Integrated Web Browser

Parker HMI

Process Control Unit

- Integrated Web Visualisation
- Integrated Security for customized access
- Multiple languages supported
- Robust and industrialised rugged hardware without moving parts
- Insertable SD Memory Card and low voltage technology, fanless operation guarantees „no maintenance“
- Standardised and open Interfaces for simple system integration via Ethernet
- Dual LAN TCP/IP as standard
- USB flash drive for data storage and easy acces e.g. via FTP.

Process Control Unit

Parker Servo Drive PSD1S/M

- Hiperface DSL feedback®
- Reduced cabling; only one cable connection between drive & motor
- EtherCAT communication
- Quick and easy wiring
- Removable SD card
- CE Conformity & UL / cUL Compliant
- Hardware STO (max PLe according EN ISO13849)
- Safety Option Board

PSD1S

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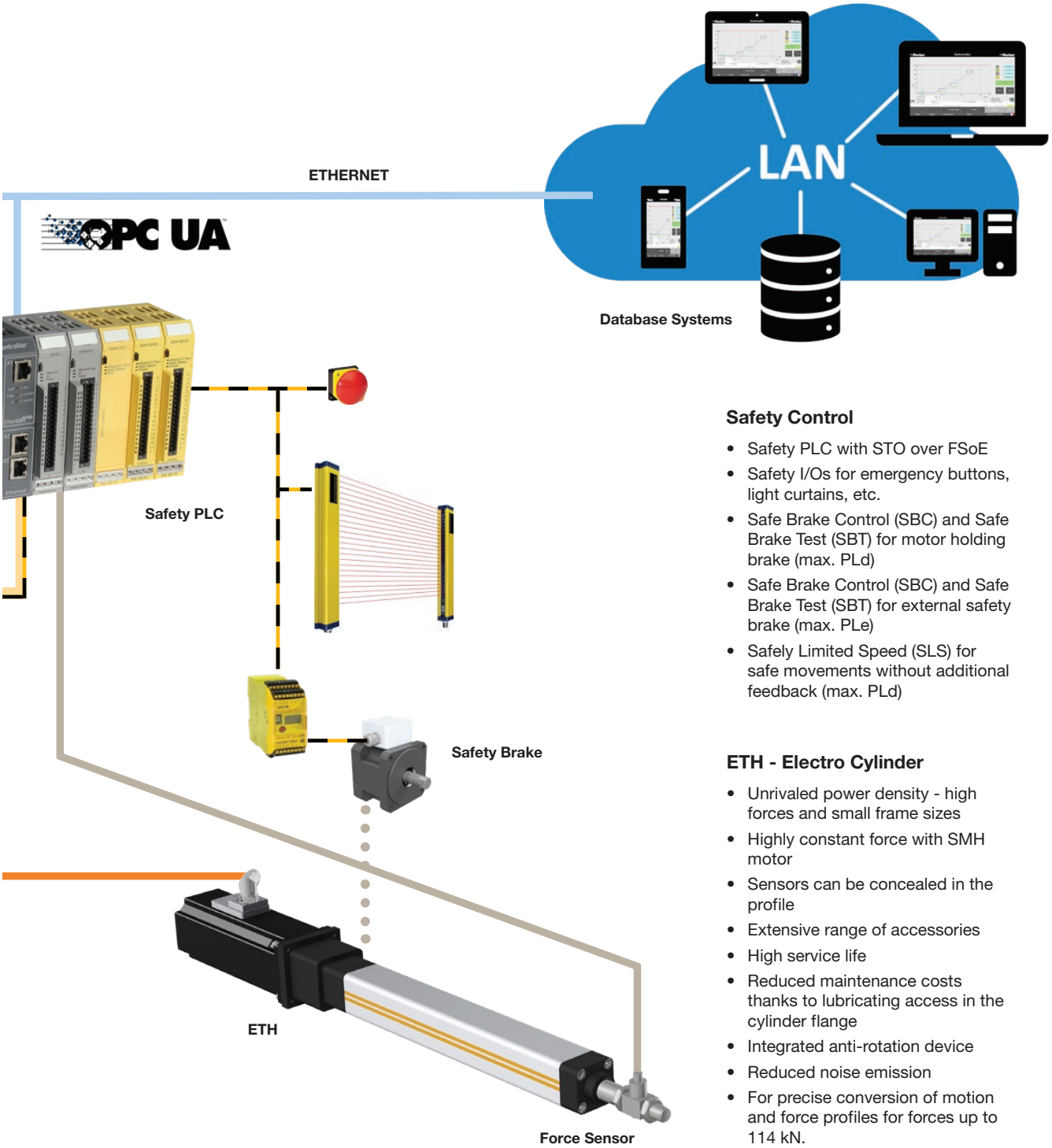

Safety Control

- Safety PLC with STO over FSoE
- Safety I/Os for emergency buttons, light curtains, etc.
- Safe Brake Control (SBC) and Safe Brake Test (SBT) for motor holding brake (max. PLd)
- Safe Brake Control (SBC) and Safe Brake Test (SBT) for external safety brake (max. PLe)
- Safely Limited Speed (SLS) for safe movements without additional feedback (max. PLd)

ETH - Electro Cylinder

- Unrivaled power density - high forces and small frame sizes
- Highly constant force with SMH motor
- Sensors can be concealed in the profile
- Extensive range of accessories
- High service life
- Reduced maintenance costs thanks to lubricating access in the cylinder flange
- Integrated anti-rotation device
- Reduced noise emission
- For precise conversion of motion and force profiles for forces up to 114 kN.

Force Sensor

- Measuring range: ± 9.3 up to ±114 kN
- Corrosion resistant stainless steel version
- Integrated amplifier
- High shock and vibration resistance
- Long term stability
- Simple mounting

Technical Characteristics

Push-To-Fit	Unit	PTF009	PTF025	PTF056	PTF114
Force, stroke, payload, speed, acceleration					
Max. axial traction / thrust force (≤ 2s)	kN	9.3	25.1	56	114
Max. continous axial force (traction / thrust force)	kN	4.9	12.8	32.1	84.1
Max. stroke [2]	mm	300	600	600	600
Max. payload	kg	100	200	400	1000
Max. travel speed	mm/s	250	450	200	133
Max. acceleration	mm/s2	4000	8000	8500	6000
Accurancy					
Repeatability (according ISO230-2)	mm	±0.03			
Linearity Deviation	kN	±0.04	±0.1	±0.2	±0.4
Weight					
Drive train	kg	7.9	38.7	70.6	166.5
Drive train with safety brake	kg	13	51.2	83.1	190.1
Mass of additional stroke	kg/m	8.2	18.2	38	62
Electrical Data					
Input Voltage (AC)	V	230V	3*400V		
Input Current (RMS)	A	11	22		
Lubrication Intervals [3]					
Normal operating conditions[1]	km	240	480	570	570
Short-Stroke conditions	mm	≤ 12.5[2]	≤ 25[2]	≤ 50[2]	
		every 10 000 movement cycles			
Ambient Conditions					
Ambient temperature	°C	0..40			
Max. operating humidity (non-condensing)	%	80			
Altitude		1000 m ASL. Derate force by 1.0 % per 100 m up to a max. altitude of 2000 m			
Software					
Motion profile instructions		20			
Tolerance band points per limit (upper / lower)		50			
Numer of tolerance windows per workpiece		5			
Number of different tolerance window types		11			
Programm cycle time	ms	1			
Sampling time	ms	1-30			
Measuring samples per motion profile		2000			
Number of different workpieces		500			
Number of internal curve storage per workpiece		500			

[1] See ETH user manual www.parker.com/eme/eth
[2] Total travel of the cylinder in one direction within one cycle
[3] The cylinder must be relubricated at least once per year

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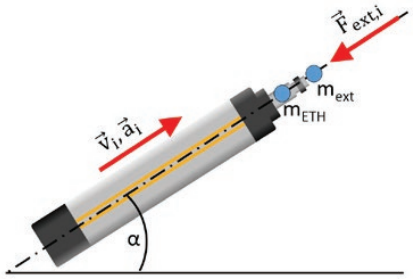
Service Life

Nominal service life[1)]

To determine the service life fist the force for each individual segment of the application cycle needs to be calculated according equation 1).



Push-To-Fit	m_{ETH}	ρ_l
PTF009	2.34kg	8.2kg/m
PTF025	7.92kg	18.2kg/m
PTF056	26.2kg	38kg/m
PTF114	68.3kg	62kg/m

$$F_{x,i} = F_{ext,i} + (m_{ETH} + \rho_l \cdot l_{stroke} + m_{ext}) \cdot (a_n + \sin(\alpha) \cdot g)$$ Formula 1[2)]

$F_{x,i}$	Axial force in N	m_{ext}	External mass in kg
$F_{ext,i}$	External axial force in N	a_n	Acceleration at the cylinder rod in m/s²
m_{ETH}	Mass of the cylinder in kg	α	Alignment angle in °
l_{stroke}	Stroke in m	g	Gravitational acceleration 9.81 m/s²
ρ_l	Mass per length (stroke) in kg/m		

The equivalent forces F_{m1} and F_{m2} to determine the nominal service life result from the sum of the positive and negative forces respectively weighted with the travel distance, according to equations (2) and (3).

$$F_{m1} = \sqrt[3]{\frac{1}{s_{total}} \cdot \sum_{i=1}^{n} F_{x,i}^3 \cdot s_i} = \sqrt[3]{\frac{1}{s_{total}} \cdot (F_{x,1}^3 \cdot s_1 + F_{x,2}^3 \cdot s_2 + \cdots + F_{x,n}^3 \cdot s_n)} \qquad F_{x,i} = \begin{cases} F_{x,i}, & F_{x,i} \geq 0 \\ 0, & F_{x,i} < 0 \end{cases}$$

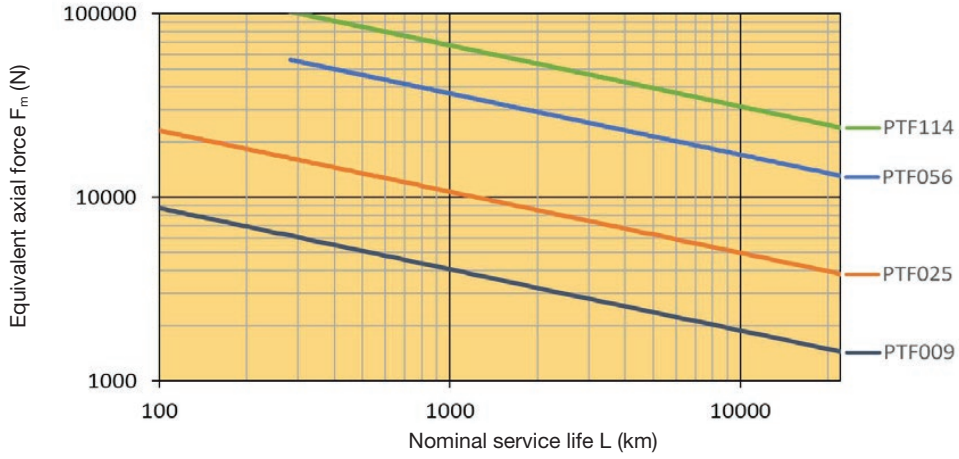
Formula 2

$$F_{m2} = \sqrt[3]{\frac{1}{s_{total}} \cdot \sum_{i=1}^{n} |F_{x,i}^3| \cdot s_i} = \sqrt[3]{\frac{1}{s_{total}} \cdot (|F_{x,1}^3| \cdot s_1 + |F_{x,2}^3| \cdot s_2 + \cdots + |F_{x,n}^3| \cdot s_n)} \qquad F_{x,i} = \begin{cases} F_{x,i}, & F_{x,i} < 0 \\ 0, & F_{x,i} \geq 0 \end{cases}$$

Formula 3

$F_{m1/2}$	Equivalent force in N	S_{total}	Total travel in m
$F_{x,i}$	Axial force in N	s_i	Travel t force $F_{x,i}$ in m

With the aid of the diagram and the equivalent forces F_{m1}, F_{m2} the nominal service life L1 and L2 can be determined. The total nominal life L results from the these two figures and equation (4).



$$L = (L_1^{-1.11} + L_2^{-1.11})^{-0.9}$$ Formula 4

L Nominal service life in km

[1)] The nominal service life is the service life reached by 90 % of a sufficient number of similar electro cylinders until the first signs of material fatigue occur.

[2)] Simplified calculation without the consideration of external friction.

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Actual service life

With the application factors f_{w1}, f_{w2} and equation (5), the service life L_{fw} is obtained.

Application factor f_{w1}

Push-To-Fit	Travel[1)]	Shocks/vibration			
		none	light	medium	heavy
PTF009	> 12.5 mm	1	1.2	1.4	1.7
PTF025	> 25 mm				
PTF056/PTF114	> 50 mm				
PTF009	< 12.5 mm	1.8	2.1	2.5	3.0
PTF025	< 25 mm				
PTF056/PTF114	< 50 mm				

Application factor f_{w2}

Push-To-Fit	Max. Force	f_{w2}
PTF009	< 7kN	1.1
	7kN…9.3kN	1.2
PTF025	< 15.1kN	1.1
	15.1kN…25.1kN	1.2
PTF056	< 46kN	1.1
	46kN…56kN	1.2
PTF114	< 96kN	1.1
	96kN…114kN	1.2

$$L_{fw} = \frac{L}{(f_{w1} \cdot f_{w2})^3}$$

Formula 5

L	Nominal service life in km
L_{fw}	Service life considering the application factors in km
f_{w1},f_{w2}	Application factors

[1)] Total travel of the cylinder in one direction within a cycle

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Application Tool Functionalities

The hub of the solution is the process control unit that supports easy integration into existing plant networks and provides simple, convenient parametrization, visualization and operation.

Features

- Real-time control information
- Historical / trend data for easy set-up (up to 500 per workpiece)
- Data can be saved as CSV file
- Adjustable sampling time
- Autocalibration
- Sensor configuration
- Database / Interfacing
- Multiple languages (German, English, French, others on request)
- Operator and service levels (adjustable user level by passowrd)
- Different motion profile instructions
- Sequence program and step enabling condition
- Monitoring via tolerance band or tolerance windows
- Error handling and configurable response
- Status display (information in plain text)
- Status page of fieldbus interface

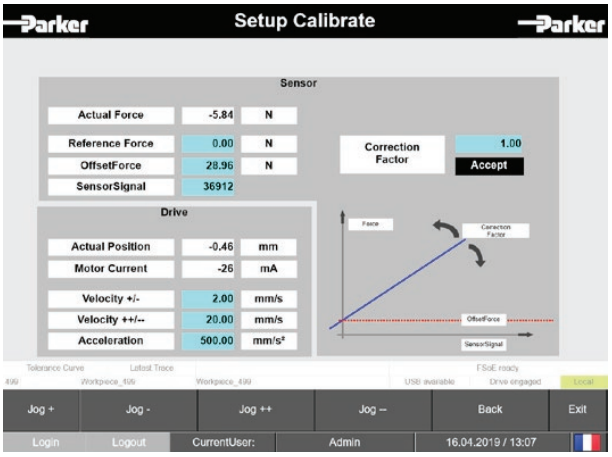
Functional Safety

Push-To-Fit is supplied with Safe Torque Off (STO) as standard to set the drive safely to a non-torque state. In addition, advanced functional safety is available with a safety PLC. Acting as a Fail Safe over EtherCAT (FSoE) master the safety PLC uses the EtherCAT fieldbus to establish safe communication to the safely I/O modules and the drive. Separate wiring is not necessary. The first expansion stage includes Safely Limited Speed (SLS) and Safe Brake Control / Safe Brake Test (SBC/SBT) for the internal motor holding brake. The second comprises an additional external safety brake with SBC/SBT up to PLe.

Primary Functionalities

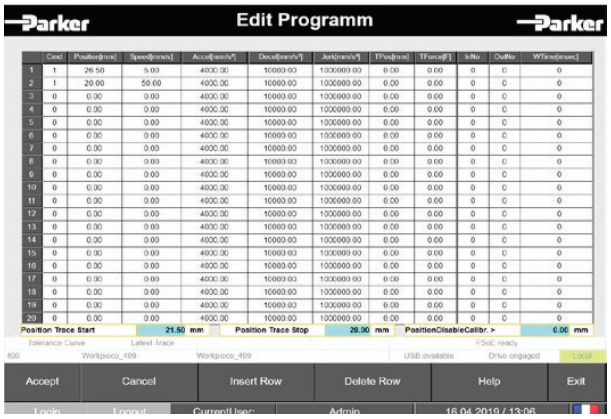
Sensor Calibration

Adjustment of the force sensor with the aid of a second measuring system. The value of the reference force of the second measuring system is entered in the input field for the reference force.
The system calculates the correction factor and stores it. Alternatively, the correction factor can be entered directly.
In addition to this basic setting, automatic offset correction in automatic mode can be activated.



Definition of the Motion Profile

- Sequential program with step enabling conditions
- Entry mask for motion profile instructions (up to 20)
- Absolute or relative positioning
- Velocity
- Acceleration/Deceleration
- Jerk
- Step enabling conditions via input, delay time, force trigger or position trigger



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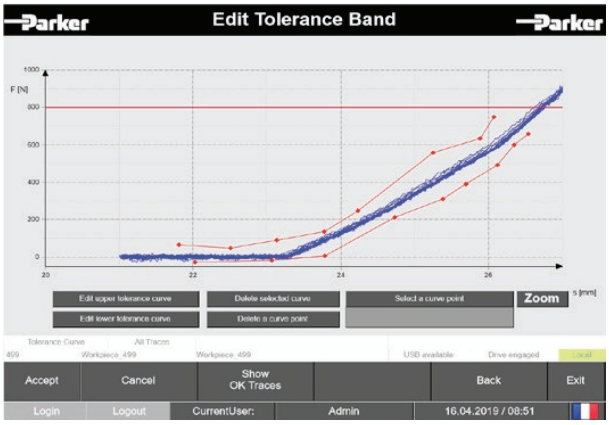
Tolerance Band

User defined tolerance band with up to 50 points per limit (each for the upper and lower one)

- Add or change point with mouse or by value
- Remove point or the whole curve

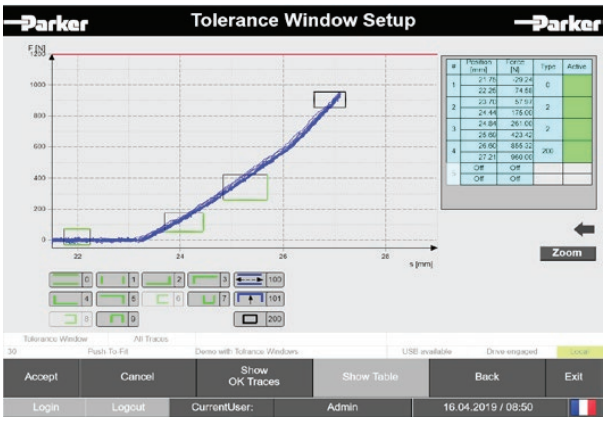
As long as the force is within the band, the process is in a good condition.

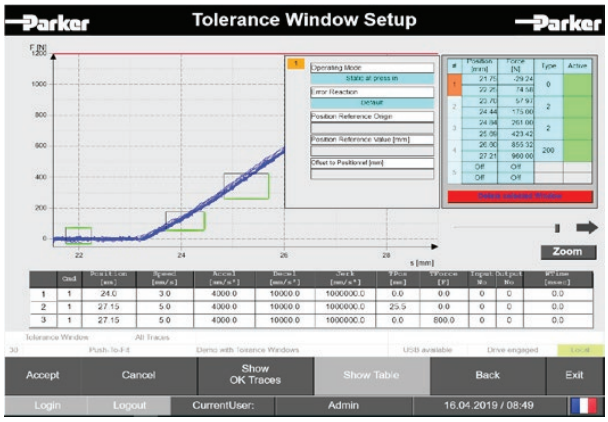
The feature to filter the 100 most recent curves (good / bad / all) and display all together helps to easy set-up the monitoring method.



Tolerance Window

Monitoring of the force using predefined tolerance windows (up to 5). There is a choice of 11 predefined window types. Windows can be defined with drag and drop or by values.
The feature to filter the 100 most recent curves (good / bad / all) and display all together helps to easy set-up the monitoring method.





In addition it is possible to use dynamic tolerance windows. According to a position instruction and a related trigger the window is shifted about a defined value.

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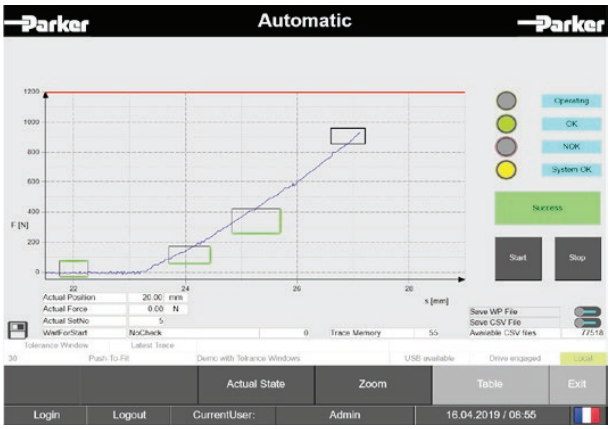
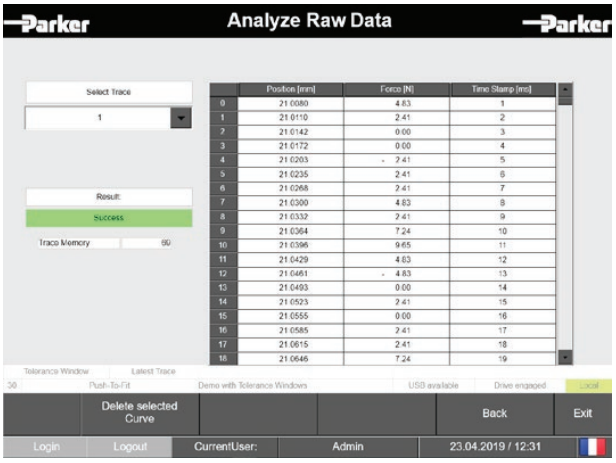
Automatic Mode

During each joining procedure real-time data as force -position curve is displayed. All tolerance windows and the tolerance band are shown as well. Additional information are available below and next to the graph. The tolerance window boundaries and the status field indicate a good or bad part with a red and green color, respectively.



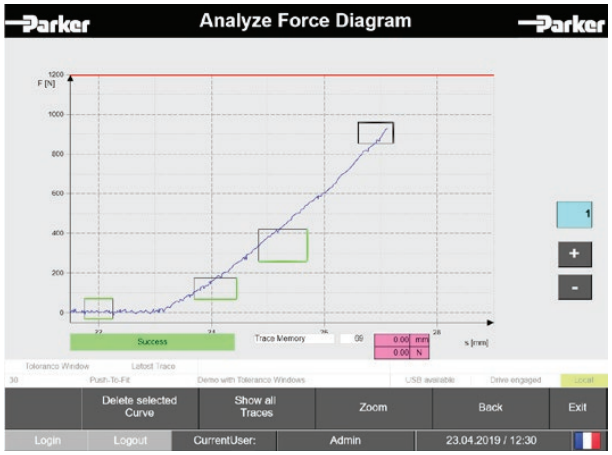
Analyze Raw Data

The last 500 curves are available by curve number and part number. The result as well as each measuring sample (position, force and time stamp) can be viewed.

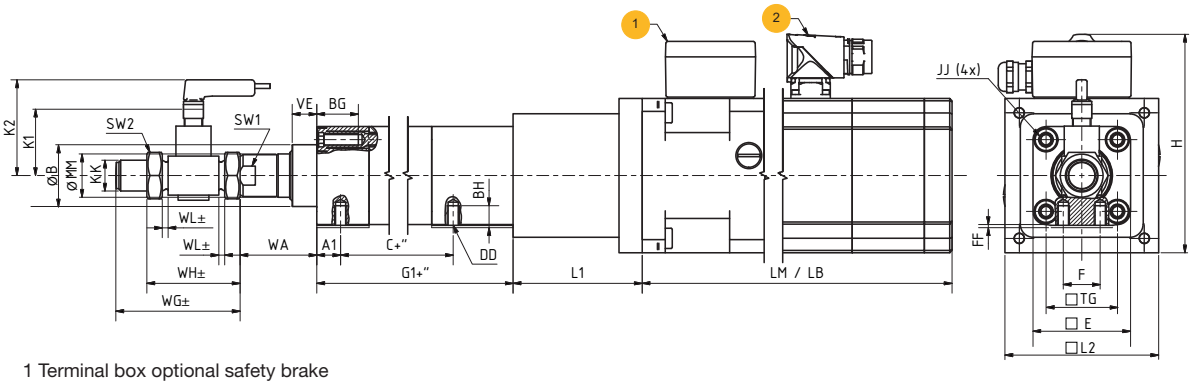


Analyze Diagram

The last 500 curves can be displyed. The 100 most recent curves can be filtered (good / bad / all) and viewed together. The result as well as the tolerance windows or the tolerance band is displayed according to each measurement.



Dimensions



1 Terminal box optional safety brake
2 Motor connector

+ "= Dimension + length of desired stroke
Position and orientation Sensor and motor connectors may differ from the illustration

	Unit	PTF009	PTF025	PTF056	PTF114
C+"	[mm]	99.5	159.5	-[1]	-[1]
G1+"	[mm]	154	215	361	549
A1	[mm]	15.5	21	-	-
BG (=BN+BS)	[mm]	25	26	32	44
BN Usable thread length	[mm]	20	20	22	33
BS Depth of key (without thread)	[mm]	5	6	10	11
BH	[mm]	12.7	18.5	-[1]	-[1]
DD	[mm]	M8x1.25	M12x1.75	-[1]	-[1]
E	[mm]	63,5	95	120	150
F	[mm]	24	30	-[1]	-[1]
FF	[mm]	0.5	1	-[1]	-[1]
H	[mm]	141.6	191.6	196.5	281.6
JJ	[mm]	M8x1.25	M10x1.5	M16x2	M20x2.5
K1	[mm]	73	73	85	85
K2	[mm]	91.5	91.5	101	101
KK	[mm]	M20x1.5	M24x2	M45x3	M45x3
L1	[mm]	84	116.5	160	226.5
L2	[mm]	100	155	155	205
LM / LB [2]	[mm]	238.5 / 318.5	510 / 629	666.5 / 785.5	742.5 / 881
SW1	[mm]	24	30	60	70
SW2	[mm]	30	36	70	70
TG	[mm]	46,5	72	89	105
VE	[mm]	16	20	20	20
WA	[mm]	60	59	92	123
WG [3]	[mm]	80.8 ± 1,5	107 ± 2	184.4 ± 3	184.4 ± 3
WH [3]	[mm]	60.6 ± 1,5	84 ± 2	136 ± 3	136 ± 3
ØB	[mm]	40 d11	60 d11	90 d8	110 d8
ØMM h9	[mm]	28	45	70	85

[1] PTF056 and PTF114 does not have a mounting thread on the underside.
[2] LM without optional safety brake / LB with optional safety brake
[3] Screw-in depth of the force sensor can vary by the thread pitch.

Accessories

Motor cable

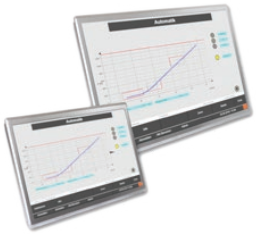
Description	PTF009	PTF025 / PTF056	PTF114
3 m	CBM015HD-M23-PSX-0030-00	CBM025HD-M23-PMX-0030-00	CBM040HD-M23-PMX-0030-00
5 m	CBM015HD-M23-PSX-0050-00	CBM025HD-M23-PMX-0050-00	CBM040HD-M23-PMX-0050-00
10 m	CBM015HD-M23-PSX-0100-00	CBM025HD-M23-PMX-0100-00	CBM040HD-M23-PMX-0100-00

Sensor cable

Description	PTF009 / 025 / 056 / 114
5 m	080-900467
10 m	080-900468

Human Machine Interface HMI

Description	PTF009 / 025 / 056 / 114
10.1"	PTA-010-1R1-13
15.5"	PTA-015-1R1-13

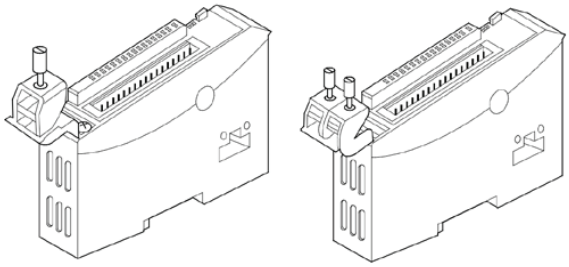


External braking resistor

Description	PTF009	PTF025	PTF056	PTF114
Resistor	internal	ACB-0001-01 (300Ω, 400W)		

Shield connection terminal block for I/O modules (PACIO-412-01 included as standard)

Description	PTF009 / 025 / 056 / 114
2 x 8 mm	PACIO-412-01
1 x 14 mm	PACIO-412-02



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Order Code

	1	2	3	4	5	6	7	8	9	10	11	12
Order example	**PTF**	**025**	**A**	**1**	**F**	**300**	**A**	**1**	**N**	**A**	**NNNNN**	**000**

1	**System name**	
	PTF	Push-To-Fit
2	**Maximal Thrust Force**	
	009	9.3 kN
	025	25.1 kN
	056	56 kN
	114	114 kN
3	**Motor mounting position, housing orientation and groove orientation** PTF025/056/114 features 2 grooves each on all 4 sides (e.g. Code B=A)	
	A 	Inline + groove for initiator 3 & 9 o'clock (standard)
	B 	Inline + groove for initiator 6 & 12 o'clock

4 Relubrication option [1]
In combination with motor mounting position, housing orientation and groove orientation

		PTF009 A	PTF009 B	all others
1	**No additional lubrication hole (standard)**		•	
2	Relubricating hole in the profile 12 o'clock		•	•
3	Relubricating hole in the profile 3 o'clock	•		•
4	Relubricating hole in the profile 6 o'clock		•	•
5	Relubricating hole in the profile 9 o'clock	•		•
6	Preparation to connect to customer central lubrication		•	

5	**Mounting type**	
	F	Thread on the cylinder body (PTF056, ETH114 does not have an additional mounting thread on the underside)
6	**Stroke in mm**	
	100	PTF009
	200, 300	PTF009 / 025 / 056 / 114
	400, 600	PTF025 / 056 / 114
7	**Holding brake**	
	A	Motor with holding brake
8	**Force Sensor**	
	1	Force sensor
	2	Force sensor with calibration sheet according to DIN EN 10204
9	**Interface**	
	N	Integrated web visualization and digital I/Os (standard)
	P	N + PROFINET
10	**Functional Safety**	
	A	Hardware STO (max. PLe, standard)
	B	Safety PLC (STO over FSoE, max. PLe), SLS (max. PLd), SBC/SBT (motor holding brake max. PLd)
	C	B + SBC/SBT with external safety brake (max. PLe)
11	**Option**	
	NNNNN	Standard
12	**Customization**	
	000	Non customized

[1] Relubrication options 2-5: The standard lubrication port is without function. In case of actuators with very short strokes, the position of the lubrication port in the center of the profile may not be possible. For more information see mounting instructions.

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Structural extrusions

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Process
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Fluid & Gas Handling

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Mobile
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