New solution for the press-fit sensing system assuring high precision press fit application

With over 20 years history as an assembly machinery maker, we have developed this comprehensive system for the high precision press fit application using hydraulic cylinder with position and load sensor press-fit sensing system "ATSUKAN"

PQC Series is based on **TAIYO** hydraulic cylinders having high reliability.

This system basically consists of the cylinder with sensors in order to get pairs of data, the load value against its stroking position from the stroke sensor and exclusive control unit which will offer the result of the press fit action judgment method based on press-fit sensing system.

A variety of options including data processing software is available for various purpose.

Simple Design

The cylinder has patented for the built-in stroke sensor and load sensor

❶ Selection of one cylinder completes design of precision press.

❷ No need to machine, mount or adjust dozens of parts for sensing.

❸ Fatigue failure of load sensor cable is eliminated because load sensor is fixed fatigue disconnection of load sensor cable

Stroke sensor
Stroke sensor
Load sensor
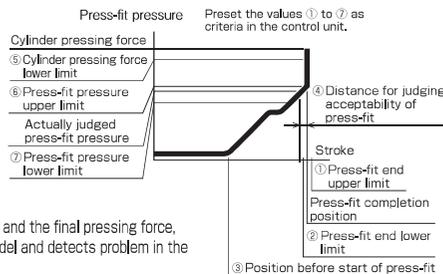Load sensor
Conventional mechanism
Mechanism of "ATSUKAN"
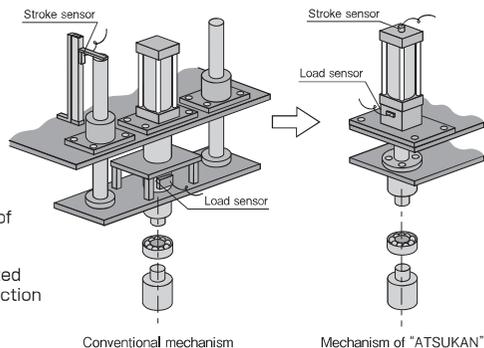
High Quality High press-fitting quality assured by an innovative judgment method

Conventional press-fit judgment methods by switching between high and low hydraulic pressures and methods of judging peak values before press-fit end must exclude the area near the press-fit end from the judgment range because of difference in responsibility among control devices, scanning timing of programmable control unit and press-fit end variation owing to accumulated fabrication tolerances of workpieces. The system with the newly developed "judgment method based on recognized press-fit end" which recognizes the press-fit end every cycle and judges the press-fit pressure just before the press-fit end ensures high-level press-fit quality control.

In addition, the system judges the position of the recognized press-fit end and the final pressing force, which prevents inclusion of foreign particles and mounting of improper model and detects problem in the thrust force system.

Press-fit pressure
Preset the values ① to ⑦ as criteria in the control unit.
Cylinder pressing force
⑤ Cylinder pressing force lower limit
⑥ Press-fit pressure upper limit
Actually judged press-fit pressure
⑦ Press-fit pressure lower limit
④ Distance for judging acceptability of press-fit
Stroke
① Press-fit end upper limit
Press-fit completion position
② Press-fit end lower limit
③ Position before start of press-fit

Easy Programming Press-fit software based on long-term know-how of assembling machines

❶ Press-fit modes can be registered in 15 channels.

❷ Seven kinds of criteria can be preset by using the UP and DOWN keys on the control unit front panel and also by inputting current values. Therefore, when there are actual workpieces, the time to input the data can be diminished.

❸ The preset position before start of press-fit is output from the control unit every cycle, so that the data can

be used when the press-fit shaft speed is switched between high and low to reduce the cycle time.

❹ Data output is every 0.01 mm at minimum, and the storage has a capacity of up to 1000 pieces of data.

❺ Although the system can be controlled by an external programmable controller, a complicated ladder program is unnecessary because of the simple input/output.

■Specifications

●Accuracy

Item	Length measuring block	Load measuring block
Resolution	2μm	1N*
Repeatability	20μm	0.2%
Non-linearity	—	0.5% / FS
Sensor type	Linear Induct Coder type	Load cell type

＊Internal processing is performed at 1N, and judgment is performed at 10N.

●Control unit

Item	Specifications
Power supply	100 V AC ±10% 50/60Hz
Power supply capacity	30 VA(W)
Ambient temperature	0 to 45°C
Ambient humidity	85% or less. No condensing
Insulation resistance	1000 V DC 100MΩ
Weight	3kg
Indicator	16 characters × 4 digits LCD with backlight
Control input	24 V DC (16 mA/point), built-in Photo-coupler isolation
Control output	Photo-coupler open collector output (Max. 10 mA/point at 24 V DC)
Number of program channels	Up to 15 channels
Min. display unit	Length measurement 10μm
	Load 10N

＊ ● A data logger can be connected.
　● Do not connect an external power supply to the control input. The internal board will be destroyed by burn out.
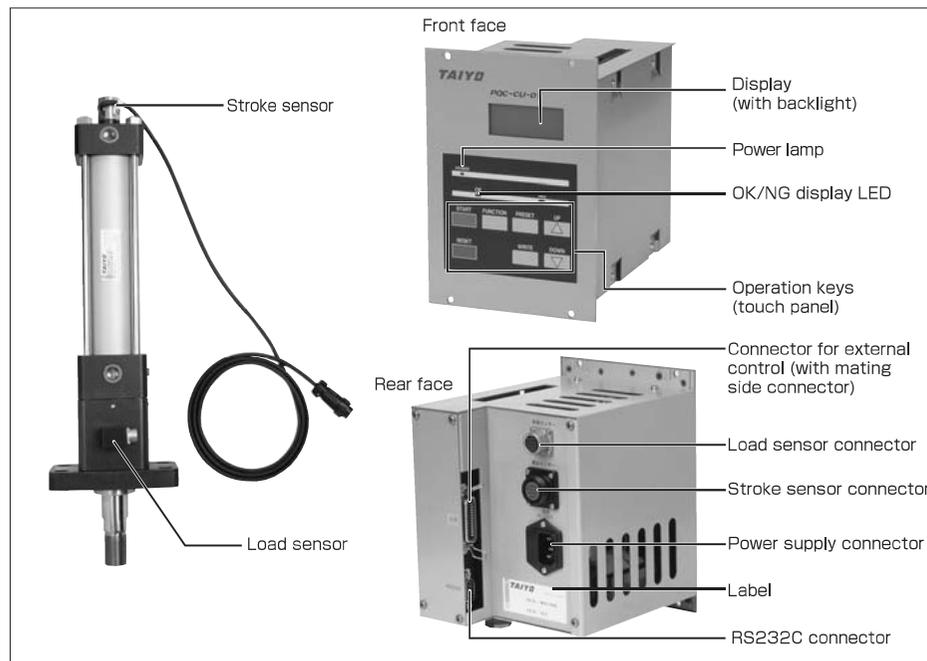
●External input/output

Pin No.	Signal name		Pin No.	Signal name
1	Input channel 0		13	Output channel 3
2	Input channel 1		14	Signal of position before start of press-fit
3	Input channel 2		15	Signal of press-fit completion position
4	Input channel 3		16	OK signal
5	START		17	LOW NG signal
6	RESET		18	HIGH NG signal
7	ZERO set (stroke)		19	MAX NG signal
8	Input AUX 0		20	SYS NG signal
9	Input COM		21	READY signal
10	Output channel 0		22	Press-fit end NG signal
11	Output channel 1		23	Output AUX 0
12	Output channel 2		24	Output COM

■Data processing software
●Operating environment

OS	Windows2000, XP (English version)
Memory	32MB or more
Disk drive	Free space of 5MB or more is necessary.

＊Windows is a registered trade mark of Microsoft Corporation, Inc., USA.

Front face
Stroke sensor
Load sensor
Rear face
Display (with backlight)
Power lamp
OK/NG display LED
Operation keys (touch panel)
Connector for external control (with mating side connector)
Load sensor connector
Stroke sensor connector
Power supply connector
Label
RS232C connector

Configuration of optional and attached parts for press-fit sensing system "ATSUKAN"

Press-fit Quality Sensing System

Set of two sensor cables

Stroke sensor cable	Load sensor cable	Set type
PQC-CV1-05-M-D(5m)	+ PQC-CV1-05-L(5m)	= PQC-CV1-05(5m)
PQC-CV1-10-M-D(10m)	+ PQC-CV1-10-L(10m)	= PQC-CV1-10(10m)

＊For the robot cables, add R.
　Example: PQC-CV1-05-R

Cylinder with stroke and load sensors

Other standard specifications for cylinder

Seal	Nitrile rubber	
Mounting style	Flange type (FG)	
Rod type	Rod B	Rod A
Nominal pressure	5 MPa·7 MPa	14 MPa
Proof test pressure	10.5 MPa	21 MPa

＊Nominal pressure of φ50 with rod B is 5 MPa.

● How to order

	Type	Seal material	Mounting style	Cylinder bore	Rod type	Cushioning	Stroke (mm)	Port position	Cushion valve position	Sensor symbol	Sensor quantity	Sensor connector position
●Standard for 7 MPa	PQC-NH	1	FG	50	B	B	100	─	A	B	00	0	E
●For 7 MPa, with sensor	PQC-NHR	1	FG	50	B	B	100	─	A	B	AH	1	E
●Standard for 14 MPa	PQC-HH	1	FG	50	A	B	100	─	A	B	00	0	E
●For 14 MPa, with sensor	PQC-HHR	1	FG	50	A	B	100	─	A	B	AH	1	E

Nitrile rubber

FG

φ50, φ63, φ80, φ100

7 MPa	14 MPa
B	A

B	Both ends cushioned
R	With cushion on rod side
H	With cushion on cap side
N	No cushion

E,F,G,H
1,2 to N

Reed sensor		Solid state sensor	
AH	AX111CE	BE	AX201CE-1
AJ	AX115CE	BF	AX205CE-1
AE	AX125CE	CE	AX211CE-1
AK	AX11ACE	CF	AX215CE-1
AL	AX11BCE		

❶ Notes on ordering Switch Set Cylinders
・When no sensor is required, specify "00" for the sensor symbol and specify "0" for the sensor quantity.

A,B,C,D,0
A,B,C,D

50,100,150,200,250
300,350,400,450,500

①Normally, the load sensor connector connecting port is fitted toward the cylinder rear end. However, if the connecting port position overlaps with the port position (A or C), the connecting port will be located at a position turned 90°clockwise. When the ports B and D are provided, the connector port cannot be located on the same surface. (See the above photo.)
②When requiring a cylinder having a non-standard stroke, separately consult us about the seal material.
③The wire of the stroke sensor is 1 m long. A connector is provided at the end.
④One rod end lock nut is supplied.

Control unit

PQC-CU-02-[VAS000]-D

Selection of judgment software
Standard: VAS000
Front gate: VAF000
Peak: VAP000
Back gate: VAB000

### Power cable

PQC-CV1-02-P　(2m)

100 V AC　With ground wire

Judgment procedures by ATSUKAN

ATSUKAN control unit PQC-CU-01 offers four judgment methods, standard (judgment based on recognized press-fit end), front gate, back gate and peak, to ensure higher-level press-fit control.
If you specify "Standard", only the judgment method based on recognized press-fit end can be used.
If you specify "Front gate", you can select "Standard", "Gate" or "Gage + standard" on the control unit operation panel.
If you specify "Back gate", only the back gate method can be used.
"Front gate" is designed for judgment using the cylinder cap end as the gate reference position.
"Back gate" is designed for judgment using the workpiece as the gate reference position.
If you specify "Peak", you can select "Standard", "Peak" or "Peak + standard" on the control unit operation panel.
The optional data processing software is applicable to the four modes and can be used to display graphs and setting lists in any mode on a personal computer.

Optional parts

Commercially available programmable controller
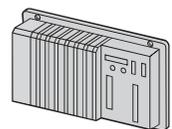
The use of the press-fit data processing software PQCSF1 and the personal computer connecting cable PQC-CV1-03-C enables you to capture the data within your personal computer to draw and store the graphs relating press-fit to stroke, process and print the data and display the lists of preset values.
The storage box PQC-BX1 is helpful in carrying the system or installing the system additionally on existing equipment.
If you do not have an external control unit, you can use the system as a stand-alone system to perform the press-fit judgment using the start key on the control unit operation panel.
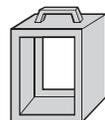● To store data, the data logger (PQC-DL1-CU) is necessary. Separately consult us.

Personal computer connecting cable

Commercially available RS232C interlink (D-Sub 9pin)
PQC-CV1-03-C(3m)

Commercially available personal computer and printer
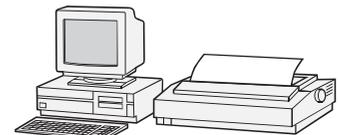
Storage box
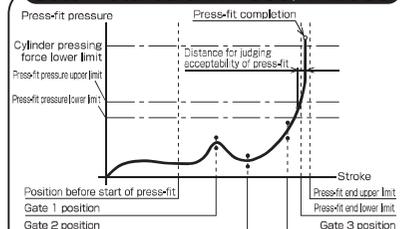
PQC-BX1

Data processing software

PQC-SF1-[VAS]
・Standard
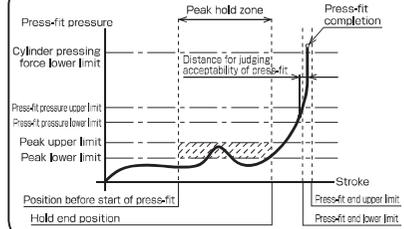・Gate
・Peak

Standard/VAS000

Press-fit pressure
Press-fit completion
Cylinder pressing force lower limit
Distance for judging acceptability of press-fit
Press-fit pressure upper limit
Press-fit pressure lower limit
Stroke
Position before start of press-fit
Press-fit end upper limit
Press-fit end lower limit
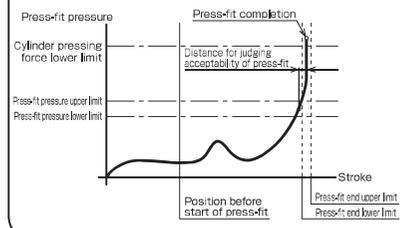
● The press-fit end is recognized every cycle, and the pressure just before the press-fit end is judged.

Gate + standard/VAF000, VAB000

Press-fit pressure
Press-fit completion
Cylinder pressing force lower limit
Distance for judging acceptability of press-fit
Press-fit pressure upper limit
Press-fit pressure lower limit
Stroke
Position before start of press-fit
Press-fit end upper limit
Press-fit end lower limit
Gate 1 position
Gate 2 position
Gate 3 position

● Number of gates: Up to 10 positions
● Some gates (passing check points) are set between the position before start of press-fit and the press-fit end, and the press-fit pressure is judged at the gates.

Peak + standard/VAP000

Press-fit pressure
Peak hold zone
Press-fit completion
Cylinder pressing force lower limit
Distance for judging acceptability of press-fit
Press-fit pressure upper limit
Press-fit pressure lower limit
Peak upper limit
Peak lower limit
Stroke
Position before start of press-fit
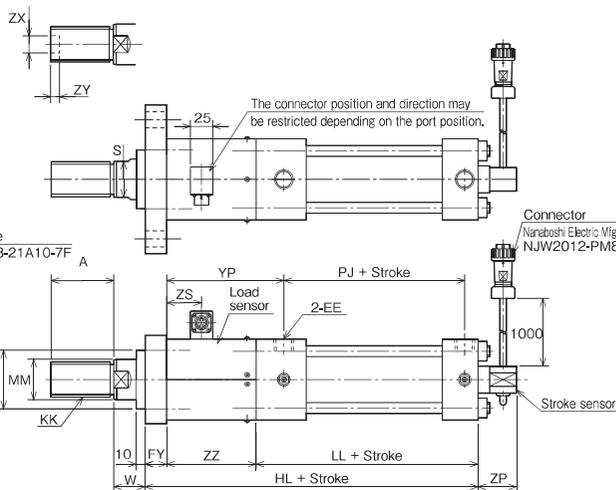Press-fit end upper limit
Press-fit end lower limit
Hold end position

● A certain zone (peak hold zone) from the press-fit start position is specified, and the press-fit pressure peak value in the zone is judged.

HF 6

PQC

Press-fit Sensing System/ATSUKAN Unit: mm

Unit: mm **Press-fit Sensing System/ATSUKAN**

PQC

HF 7

Cylinder unit

PQC – | NH | 1 FG | Bore | – | B | B | Stroke | – | A | B | Sensor symbol | Sensor quantity | Sensor connector position

Nominal pressure	Bore	ZY	ZX
5 MPa	φ50	10	φ19
7 MPa	φ63		
	φ80		
	φ100	20	φ25
14 MPa	φ50	10	φ19
	φ63		
	φ80	20	φ25
	φ100		

The stroke sensor is internal in the top of piston rod.
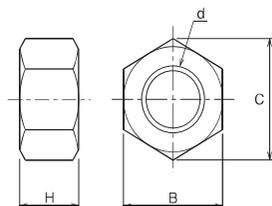When using a spring pin or the like, fit it in the range of ZY from the end face.

The connector position and direction may be restricted depending on the port position.

Connector
Nanaboshi Electric Mfg.
NJW2012-PM8

SF receptacle
Tajimi PRC03-21A10-7F

Load sensor

Stroke sensor

Control unit

PQC – CU – 02 – | Judgment software | – D

Side view   Front view   Plan view
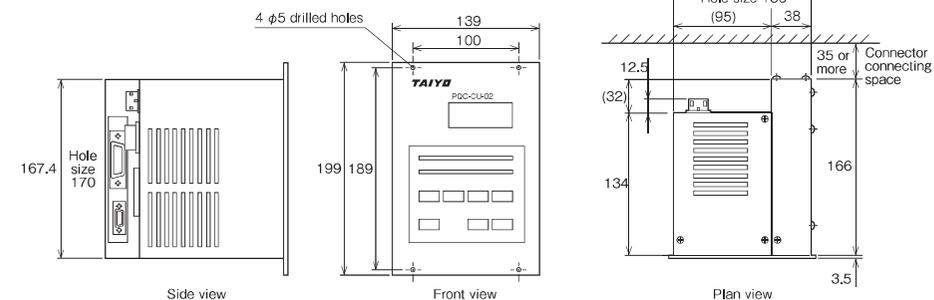
Lock nut

Dimensional table

Nominal pressure	Load	Bore	Rod type	A	B	KK	MM	S	E	EE	FY	FB
5 MPa	10kN	50	B type	45	φ46	M24×1.5	φ28	24	□76	Rc1/2	24	φ14
7 MPa	20kN	φ63		55	φ55	M30×1.5	φ35.5	30	□90	Rc1/2	24	φ18
	35kN	φ80		70	φ65	M39×1.5	φ45	41	□110	Rc3/4	30	φ18
	50kN	φ100		85	φ80	M48×1.5	φ56	50	□135	Rc3/4	32	φ22
14 MPa	25kN	φ50	A type	55	φ50	M30×1.5	φ35.5	30	□76	Rc1/2	24	φ14
	40kN	φ63		70	φ65	M39×1.5	φ45	41	□90	Rc1/2	24	φ18
	70kN	φ80		85	φ80	M48×1.5	φ56	50	□110	Rc3/4	30	φ18
	100kN	φ100		105	φ95	M64×2	φ71	65	□135	Rc3/4	32	φ22

Nominal pressure	FE	HL	LL	PJ	R	TF	UF	W	YP	ZE	ZS	ZZ	ZP
5 MPa	85	246	142	98	58	115	145	30	109	26.5	28.5	80	43
7 MPa	98	262	148	102	65	132	165	35	121	27	34	90	43
	118	326	166	110	87	155	190	35	168	27	54	130	43
	150	351	185	116	109	190	230	40	172	23.5	61	134	30
14 MPa	85	266	142	98	58	115	145	41	129	26.5	38.5	100	43
	98	292	148	102	65	132	165	48	151	27	49	120	43
	118	336	166	110	87	155	190	51	178	27	59	140	43
	150	361	185	116	109	190	230	57	182	23.5	66	144	30

Dimensional table/Lock nut

Symbol / Bore	Rod B					Rod A				
	Part number	B	C	d	H	Part number	B	C	d	H
φ50	LNH-24F-H	32	37.0	M24×1.5	14	LNH-30F-H	41	47.3	M30×1.5	17
φ63	LNH-30F-H	41	47.3	M30×1.5	17	LNH-39F-H	55	63.5	M39×1.5	20
φ80	LNH-39F-H	55	63.5	M39×1.5	20	LNH-48F-H	70	80.8	M48×1.5	26
φ100	LNH-48F-H	70	80.8	M48×1.5	26	LNH-64F-H	90	104	M64×2	35

⚠ CAUTION

Cautions for use
①Avoid connecting fixed piping to the cylinder unit. Use flexible hoses.
②As a rule, use the cylinder perpendicularly to the ground. If the cylinder is used in another direction, please contact us.
③If the cylinder unit must be disassembled for maintenance, please contact us.
④The stroke sensor is internal in the top of piston rod. When using a spring pin or the like, fit it within the range shown in the above dimensional table.
⑤The press-fit sensing system does not have a positioning function.