

Bettis XTE3000

Partial Stroke Test



Revision Details

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NOTE:

This Manual gives instruction regarding only the Partial Stroke Test function of XTE3000; detailed and complete information for setting and control of the Electric Actuator XTE3000 are in the Installation, Operation and Maintenance Manual of XTE3000, which is part of the mandatory instructions documentation.

⚠ WARNING

It is assumed that installation, setting, commissioning, maintenance and repair works on XTE3000 are carried out by qualified personnel and checked by responsible specialists.

Section 1: Partial Stroke Test (PST)

The function Partial Stroke Test (PST) of XTE3000 is used to check the actuator and valve functionality while they are in service in the pipeline. The test is performed only if the actuator is fully open or closed.

PST function is available only if the setting of parameter “Restricted, Interlock mode” of XTE3000 is “Advanced.” In the above condition the hardwired inputs B4 and B5 of XTE3000 terminal board work as input commands to initiate the PST cycle. Firmware version of XTE3000 base card should be ≥ 9.00 .

Table 1 shows the operation of the above inputs in function of parameter “Interlock mode,” in the “VIEW and SETUP menu, Restricted,” (see Installation, Operation and Maintenance Manual of XTE3000).

Table 1.

XTE3000 Parameter “Restricted, Interlock mode”	Terminal B4 of XTE3000 terminal board	Terminal B5 of XTE3000 terminal board
advanced	PST in Open direction	PST in Close direction
standard	Interlock in Open direction	Interlock in Close direction

The PST cycle (Partial Stroke Test) consists of the following steps:

- To drive the electrical motor to move the valve to the configured position (PST travel)
- To measure the time to reach the configured position (T-PST)
- To stop the motor when configured position is reached and measure the over-travel % (OV-TR)
- To stay in position for a configured time
- To drive of the motor to move the valve in opposite direction to the initial position
- To measure the time to return to the initial position (T-RET)

Figure 1 and Figure 2 shows the actuator position % versus time in case of PST in closing and opening direction.

Figure 1

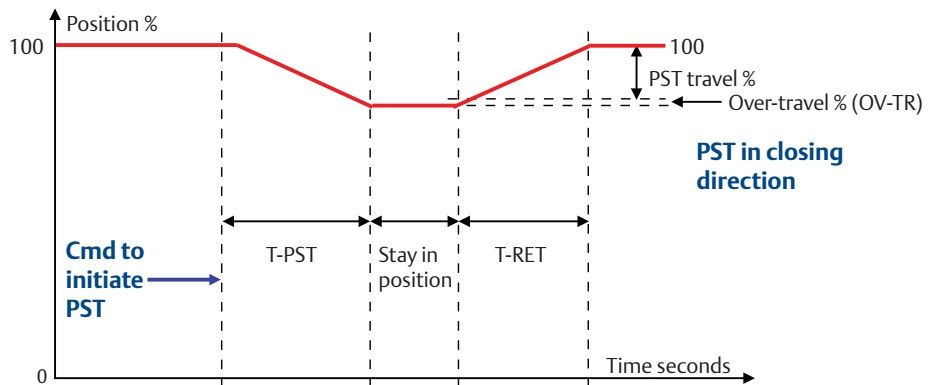
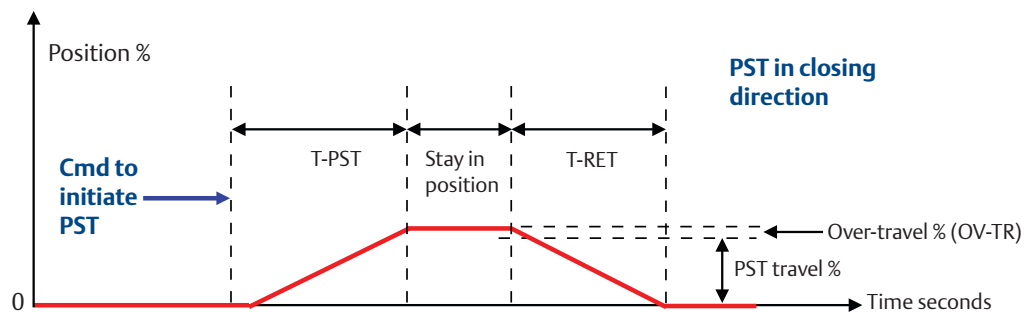


Figure 2



Section 2: Parameters of Partial Stroke Test

The following parameters are available in the local operator interface of XTE3000, VIEW and SETUP menu, ACTUATOR SETUP, PST SETUP routine, to set PST function behavior:

1. **PST mode:** OFF, AUTO, MANUAL
 - OFF: PST function disabled
 - AUTO: PST cycle carried out automatically and cyclically with time interval set by the parameter PERIOD and at time set by the parameter HOUR of DAY
 - MANUAL: PST cycle carried out on receiving of a remote hardwired PST signal or by local command available in the “VIEW and SETUP menu, Maintenance functions” of XTE3000
 - MAN-AUTO: both automatic and manual mode initiate the PST function
2. **PERIOD:** time interval between PST's in days, configurable from 1 - 1000, in PST mode “AUTO”
3. **HOUR of DAY:** hour of PST, in hour, configurable from 0 - 23, in PST mode “AUTO”
4. **PST TRAVEL:** position travel during PST cycle, in % of position, configurable from 5 - 40. If actuator is fully open it moves from 100% to “100-PST TRAVEL %”, if actuator is fully closed it moves from 0% to “PST TRAVEL %”
5. **MAX T-PST:** max time allowed carrying out the PST TRAVEL, measured in % of relevant BASELINE time, configurable from 1 - 1000%
6. **MAX PST T-RET:** max time allowed to return to initial position, measured in % of relevant BASELINE time, configurable from 1 - 1000%
7. **PAUSE:** time of stay in position of actuator, in seconds, configurable from 2 - 255 seconds
8. **MAX PST OV-TR:** max position over-travel allowed to actuator during PST cycle, in percentage of position , configurable from 1 - 100

Section 3: Command to Initiate the PST Cycle

PST cycle initiates only if:

- actuator is fully open or closed
- local selector of actuator is in REMOTE or LOCAL
- local STOP, remote STOP (only in the option 4 wires mode) and ESD are not active

The parameter “PST mode” sets the following modes to initiate PST cycle:

- **“AUTO”**: the PST cycle initiates at the hour set by the parameter HOUR of DAY and when the time past from the last PST is equal to parameter PERIOD. The test is performed if the actuator local selector is in LOCAL or REMOTE.
- **“MANUAL”**: if the XTE3000 local selector is in REMOTE, the PST is performed on receiving of the hardwired command on the XTE3000 terminal board. Terminal B4 is the input to perform PST in open direction and terminal B5 is the input to perform PST in close direction. Refer to relevant electrical diagram for wiring details. If the XTE3000 local selector is in LOCAL, the PST can be initiated by the command available in the menu “VIEW and SETUP menu, SETUP, MAINTENANCE routines, PST cmd”.
- **“MAN-AUTO”**: both conditions described in “AUTO” and “MANUAL” initiate PST action.

Section 4: Reset of PST Cycle

PST cycle aborts in the following conditions:

- To move the XTE3000 Local selector to OFF, LOCAL or REMOTE while PST cycle is in progress
- Alarm of electrical actuator XTE3000
- To press the Local STOP pushbutton
- To press the remote STOP command (only if option “4-wires” is used, see Installation, Operation and Maintenance Manual of XTE3000, Section 5.6, Remote Control)
- ESD command

Section 5: PST Curves and PST Baseline

During PST cycle, the actuator position % and the relevant time are collected in the RAM memory of XTE3000. At the end of PST cycle, the PST profile (position versus time) is memorized in the permanent memory. The memory contains up to 16 PST profiles. When a new set of data is available, the oldest profile is deleted and the new one is stored.

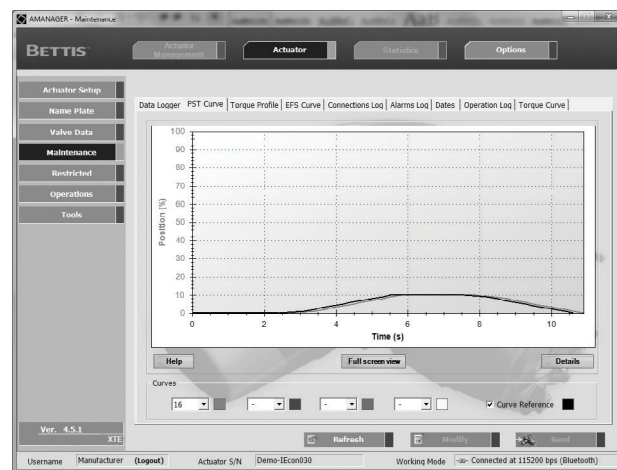
By the command “SET PST REFERENCE”, available in the local operator interface, option “VIEW and SETUP menu, SETUP, MAINTENANCE” routines, 1 out of 16 “PST curves” can be copied and frozen in the “PST BASELINE” memory.

The BASELINE curve can also be done by the PST command, available in the “VIEW and SETUP menu, SETUP, MAINTENANCE, PST cmd” routines. By selecting the option “BASELINE” the PST command causes the PST cycle execution and the collected data are saved in the PST BASELINE memory.

The “PST BASELINE” can be updated only by a new “SET PST BASELINE” command. By the comparison between PST BASELINE and PST curves, the XTE3000 can produce status and warning useful in maintenance operation.

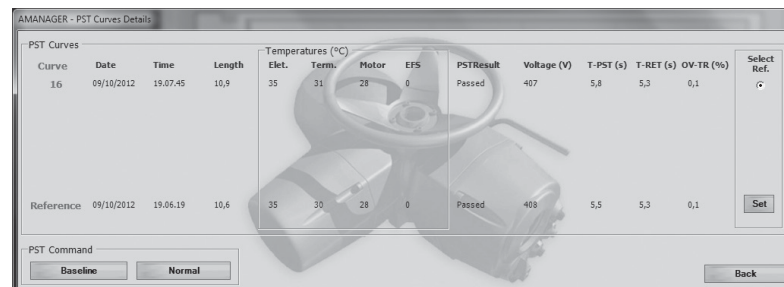
By PC or PDA and DCMLink software tool, the curves can be read from XTE3000 and then visualized and compared in a graph.

Figure 3 Example of PST in opening



PST curve in opening: gray line
BASELINE curve: black line

Figure 4 PST curve details



PST curve details

Section 6: PST Report and Warning

At the end of PST cycle, the new data collected are compared with the BASELINE and the setpoints "MAX T-PST, MAX PST T-RET, MAX PST OV-TR to produce the following status and warnings:

Table 2.

Status	Description	Warning	Note
Passed	Test OK	-	No message on the XTE3000 display
Reset	test aborted	PST	See reset conditions
T-PST	failed time T-PST	T-PST	See parameter MAX T-PST
T-RET	failed time T-RET	T-RET	See parameter MAX PST T-RET
OV-TR	PST over-travel	OV-TR	See parameter MAX PST OV-TR
Failed	at least two of T-PST, T-RET, OV-TR, reset	Failed	-

Warning can be viewed by the local operator interface of XTE3000 or by a PC/PDA connected via Bluetooth interface. Warnings are also recorded in the warning log registers (see Installation, Operation and Maintenance Manual of XTE3000, VIEW and SETUP menu, maintenance routines).

Section 7: Remote Signalling

The following conditions can be individually configured to switch the auxiliary relays As1 - As8.

- PST active: PST cycle in progress.
- PST failed: it summarizes T-PST, T-RET, OV-TR and reset. The status of relay “PST failed” can be reset by a manual reset of warning via actuator local operator interface or alternatively by a new PST command.

Section 8: Local Operator Interface

When PST cycle is in progress, the display of XTE3000 shows the message “PST ON”.



The following paragraphs report the instructions to operate with PST function by the Local Operator Interface of XTE3000 (refer to Installation, Operation and Maintenance Manual of XTE3000, Section 9.1.5 for detailed instruction relevant to configuration options).

8.1 Procedure to Initiate PST by Local Command

1. Move the local selector in OFF and then simultaneously press OPEN and STOP. Select the language, enter the password and press YES to select SETUP MODE (see Installation, Operation and Maintenance Manual of XTE3000, Section 9.1.5, Local Controls).
2. Press NO and again NO until the display shows MAINTENANCE. Press YES.
3. Press NO to scroll the list of options and press YES when the display shows “PST cmd”.
4. Press YES to confirm “NEW BASELINE disabled”, press YES to execute a normal PST cycle, press NO and then YES to execute a “NEW BASELINE”.
5. Press YES to confirm and then move the local selector in LOCAL.
6. PST cycle starts, the XTE display shows the message “PST ON”.
7. At the end of PST cycle, the message “PST ON” disappears and actuator is available to normal operations.

8.2 Procedure to Select the BASELINE

1. Move the local selector in OFF and then simultaneously press OPEN and STOP. Select the language, enter the password and press YES to select SETUP MODE (see Installation, Operation and Maintenance Manual of XTE3000, Section 9.1.5, Local Controls).
2. Press NO and again NO until the display shows MAINTENANCE. Press YES.
3. Press NO to scroll the list of options and press YES when the display shows “PST REFERENCE”.
4. In the menu SEL. CURVE select the curve number. Press NO to change, press YES to confirm. The most recent curve is the n° 16 is and the oldest one is the n° 1.
5. Press YES to confirm. The display shows the message REFERENCE OK. Now the new BASELINE is the curve selected at the previous step.
6. The display returns to “SET PST REFERENCE”. Press simultaneously YES and NO to exit from menu.

8.3 Procedure to Set PST Parameters

Move the local selector in OFF and then press simultaneously OPEN and STOP



Press NO to scroll the list of languages and press YES when the display shows the desired language and to switch to next step



Press NO to select SETUP MODE



Enter password



Press YES to select SETUP MODE



Press YES to select ACTUATOR SETUP and switch to next step



Detailed instructions of XTE3000 menu are in the Installation, Operation and Maintenance Manual of XTE3000, Section 9.1.5, Local Controls.

Press NO to scroll the list of options and press YES when the display shows "PST SETUP"



Press NO to select PST MODE. Options available are OFF, MANUAL, MAN-AUTO



Press YES if desired option is MANUAL and switch to next parameter PERIOD



Press YES if desired option is MAN-AUTO and switch to next parameter PERIOD



Press NO to change PERIOD. Press YES to set the PERIOD and switch to next parameter HOUR of DAY



Press NO to change HOUR of DAY. Press YES to set the HOUR of DAY and switch to next parameter PST TRAVEL



Press NO to change PST TRAVEL. Press YES to set the PST TRAVEL and switch to next parameter MAX T-PST



Press NO to change MAX T-PST. Press YES to set the MAX T-PST and switch to next parameter MAX PST T-RET



Press NO to change MAX PST T-RET. Press YES to set the MAX PST T-RET and switch to next parameter PAUSE



Press NO to change PAUSE. Press YES to set the PAUSE and switch to next parameter MAX PST OV-TR



Press NO to change MAX PST OV-TR. Press YES to set the MAX PST OV-TR and switch to PST SETUP



Press simultaneously YES and NO to exit from PST SETUP menu



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