**SCADA\_DEV\_MOTOR**

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| **Version** | **Release Notes** |
| 1.0 | Initial Release, combining logic from previous iterations of Pump and VFD controls |

**Description**: This UDT is used for implementation of motor control and status. Main uses for this AOI will be for pumps, whether controlled by a fixed speed starter or Variable Frequency Drive (VFD). The AOI is also compatible with any other device intended to run continuously when commanded to do so.

**Naming Convention**: Tags using this UDT should be named using the first four fragments as defined in the tagging standard. Fragment 4 will generally be DM1 for fixed speed motors and VF1 for VFDs.

**UDT Members**

| **UDT Member** | **Datatype** | **Description** | **Usage** |
| --- | --- | --- | --- |
| ADDON | GEN\_V1 | Generator state evaluation AOI | Within the Device Program of the PLC |
| SCALE\_CV | SCALE\_FBD\_v2 | Output Scaling Block for Speed Command | Use in AO routine to scale engineering speed output to 4-20 mA signal |
| SCALE\_SK | SCALE\_FBD\_v2 | Output Scaling Block for Stroke Command | Use in AO routine to scale engineering stroke output to 4-20 mA signal |
| DI\_AA | BOOL | Plant Auto Mode | Used on HMI |
| DI\_AS | BOOL | Plant Auto Mode Stroke | Used on HMI |
| DI\_PM | BOOL | Plant Manual Mode | Used on HMI |
| DI\_MS | BOOL | Plant Manual Stroke | Used on HMI |
| DI\_AD | BOOL | At least One Alarm Disabled | Used on HMI |
| DA\_SF | BOOL | Fail to Start Alarm | Used on HMI |
| DA\_XF | BOOL | Fail to Stop Alarm | Used on HMI |
| DA\_SU | BOOL | Uncommanded Start Alarm | Used on HMI |
| DA\_XU | BOOL | Uncommanded Stop Alarm | Used on HMI |
| PB\_PM | BOOL | Plant Manual Mode Request | Used on HMI |
| PB\_MS | BOOL | Plant Manual Mode Stroke Request | Used on HMI |
| PB\_PT | BOOL | Manual Mode Start Request | Used on HMI |
| PB\_PP | BOOL | Manual Mode Stop Request | Used on HMI |
| PB\_RT | BOOL | Runtime and Starts Counter Reset | Used on HMI |
| PB\_AR | BOOL | Alarm Acknowledge/Reset | Used on HMI |
| PB\_SM | BOOL | Alarm Simulate PB | Used on HMI |
| DO\_TS | BOOL | Motor Start Command | Map in DO\_Eval to Output Card for motors with pulsed start wiring |
| DO\_PS | BOOL | Motor Stop Command | Map in DO\_Eval to Output Card for motors with pulsed stop wiring |
| DO\_ST | BOOL | Maintained Run Status | Map in DO\_Eval for motors that require a maintained signal to run |
| PB\_SV | BOOL | Simulate Pushbutton | Map in DO\_Eval |
| DO\_SV | BOOL | Simulate Start Command | Map in DO\_Eval |
| AI\_TD | DINT | Number of Starts Today | Optional HMI Use |
| AI\_MT | DINT | Number of Starts This Month | Optional HMI Use |
| AI\_MX | DINT | Total Starts since last Reset | Optional HMI Use |
| AI\_RT | REAL | Runtime Hours | Used on HMI |
| SI\_CT | REAL | Manual Speed Setpoint from HMI | Used on HMI |
| SK\_CT | REAL | Manual Stroke Setpoint from HMI | Used on HMI |
| AO\_CV | REAL | Speed Command | Use in accordance with SCALE\_CV |
| AO\_SK | REAL | Stroke Command | Use in accordance with SCALE\_SK |
| DI\_OF | SCADA\_SYS\_DI\_1\_2 | On Backup Control | Programmed in DI\_EVAL Routine |
| DI\_ST | SCADA\_SYS\_DI\_1\_2 | Hardwired Start Input | Programmed in DI\_EVAL Routine |
| DI\_SP | SCADA\_SYS\_DI\_1\_2 | Hardwired Stop Input | Programmed in DI\_EVAL Routine |
| DI\_CL | SCADA\_SYS\_DI\_1\_2 | Control Mode Input | Programmed in DI\_EVAL Routine |
| DI\_SK | SCADA\_SYS\_DI\_1\_2 | Stroke Control Mode Input | Programmed in DI\_EVAL Routine |
| DI\_SS | SCADA\_SYS\_DI\_1\_2 | Run Status Input | Programmed in DI\_EVAL Routine |
| DI\_BP | SCADA\_SYS\_DI\_1\_2 | On Bypass Starter Circuit Input | Programmed in DI\_EVAL Routine |
| DA\_DF | SCADA\_SYS\_DI\_1\_2 | Not Ready Input | Programmed in DI\_EVAL Routine |
| DA\_PL | SCADA\_SYS\_DI\_1\_2 | Low Suction Pressure Input | Programmed in DI\_EVAL Routine |
| DA\_RA | SCADA\_SYS\_DI\_1\_2 | Overload Input | Programmed in DI\_EVAL Routine |
| DA\_ES | SCADA\_SYS\_DI\_1\_2 | E-Stop Input | Programmed in DI\_EVAL Routine |
| DA\_PH | SCADA\_SYS\_DI\_1\_2 | High Discharge Pressure Input | Programmed in DI\_EVAL Routine |
| DA\_MA | SCADA\_SYS\_DI\_1\_2 | Loss of Prime Input | Programmed in DI\_EVAL Routine |
| DA\_VM | SCADA\_SYS\_DI\_1\_2 | Vacuum Alarm Input | Programmed in DI\_EVAL Routine |
| DA\_GA | SCADA\_SYS\_DI\_1\_2 | Soft Starter or VFD Fault Input | Programmed in DI\_EVAL Routine |
| DA\_BT | SCADA\_SYS\_DI\_1\_2 | Bearing Temperature Alarm Input | Programmed in DI\_EVAL Routine |
| DA\_HA | SCADA\_SYS\_DI\_1\_2 | Overtorque Input | Programmed in DI\_EVAL Routine |
| DA\_WA | SCADA\_SYS\_DI\_1\_2 | Winding Temperature Alarm Input | Programmed in DI\_EVAL Routine |
| DA\_TH | SCADA\_SYS\_DI\_1\_2 | High Temperature Input | Programmed in DI\_EVAL Routine |
| DA\_TA | SCADA\_SYS\_DI\_1\_2 | Temp/Leak Alarm Input | Programmed in DI\_EVAL Routine |
| DA\_FA | SCADA\_SYS\_DI\_1\_2 | No Flow Input | Programmed in DI\_EVAL Routine |
| PB\_SF | PB\_EN\_RA\_DLR\_1\_2 | Fail to Start Enables | Used on HMI |
| PB\_XF | PB\_EN\_RA\_DLR\_1\_2 | Fail to Stop Enables | Used on HMI |
| PB\_SU | PB\_EN\_RA\_DLR\_1\_2 | Uncommanded Start Enables | Used on HMI |
| PB\_XU | PB\_EN\_RA\_DLR\_1\_2 | Uncommanded Stop Enables | Used on HMI |
| PB\_AE | PB\_EN\_RA\_DLR\_1\_2 | Virtual Alarm Enables | Used on HMI |

**AOI**

The AOI will be implemented within a motor routine within the Device Program.

| **AOI Parameter** | **Requirement** | **Default Value** | **Description** | **Implementation Guideline** |
| --- | --- | --- | --- | --- |
| Motor\_v1 | Mandatory | *Tagname.*ADDON | Motor AOI | N/A |
| Alarm\_Sim\_Enable | Mandatory | *Tagname*.PB\_SM | Alarm Simulate PB | N/A |
| Control\_Mode | Mandatory | *Tagname*.DI\_CL.eng | Control Mode Input Status | N/A |
| Stroke\_Control\_Mode | Mandatory | *Tagname*.DI\_SK.eng | Stroke Control Mode Input Status | N/A |
| Running \_Status | Mandatory | *Tagname*.DI\_SS.eng | Generator Running Status | N/A |
| Station\_Control\_Power | Mandatory | *BXXPSB1CP1DA\_JR*.eng | Control Power status, masks alarms when power fails | Replace with a suitable power detection tag if control power failed status not available. |
| Manual\_Mode | Mandatory | *Tagname*.DI\_PM | Manual Mode Status | N/A |
| Auto\_Mode | Mandatory | *Tagname*.DI\_AA | Auto Mode Status | N/A |
| Manual\_Stroke | Mandatory | *Tagname*.DI\_MS | Manual Stroke Status | N/A |
| Auto\_Stroke | Mandatory | *Tagname*.DI\_AS | Auto Stroke Status | N/A |
| Manual\_Mode\_Request | Mandatory | *Tagname*.PB\_PM | Toggle Between Pant Auto and Plant Manual Mode | N/A |
| Manual\_Stroke\_Request | Mandatory | *Tagname*.PB\_MS | Toggle Between Pant Auto and Plant Manual Stroke Mode | N/A |
| Manual\_Stop\_Request | Mandatory | *Tagname*.PB\_PP | Manual Start Request from HMI | N/A |
| Manual\_Start\_Request | Mandatory | *Tagname*.PB\_PT | Manual Stop Request from HMI | N/A |
| Auto\_Stop\_Request | Optional | *Tagname*.ADDON.Auto\_Stop\_Request | Plant Auto Stop Request | Programmed outside AOI according to automatic control requirements |
| Auto\_Start\_Request | Optional | *Tagname*. ADDON.Auto\_Start\_Request | Plant Auto Start Request | Programmed outside AOI according to automatic control requirements |
| Backup\_Disable | Optional | *Tagname*. ADDON.Backup\_Disable | Motor on Backup Control, disable PLC controls | Program outside AOI with any conditions that warrant disabling PLC control and virtual alarms for the device. Status will still be monitored. |
| Stop\_Output | Mandatory | *Tagname*.DO\_PS | Motor Stop Command | Map in DO\_Eval to Output Card for motors with pulsed start wiring |
| Start\_Output | Mandatory | *Tagname*.DO\_TS | Motor Start Command | Map in DO\_Eval to Output Card for motors with pulsed stop wiring |
| Maintained\_Run\_Enable | Mandatory | *Tagname*.DO\_ST | Motor Run Command | Map in DO\_Eval to Output card if motor requires a maintained signal to operate |
| Alarm\_Disabled | Mandatory | *Tagname.*DI\_AD | At least one alarm disabled | N/A |
| Alarms\_Enable | Mandatory | *Tagname.*PB\_AE | Global Alarm Enables | N/A |
| Fail\_To\_Start\_Enable | Mandatory | *Tagname.*PB\_SF | Fail to Start Enables | N/A |
| Fail\_To\_Start\_Mask | Optional | *Tagname.*ADDON.Fail\_to\_Start\_Mask | Fail to Start Alarm Mask | Program external to the AOI with conditions that should inhibit the evaluation of the alarm logic |
| Fail\_To\_Start | Mandatory | *Tagname.*DA\_SF | Fail to Start Alarm | N/A |
| Fail\_To\_Stop\_Enable | Mandatory | *Tagname.*PB\_XF | Fail to Stop Enables | N/A |
| Fail\_To\_Stop\_Mask | Optional | *Tagname.*ADDON.Fail\_to\_Stop\_Mask | Fail to Stop Alarm Mask | Program external to the AOI with conditions that should inhibit the evaluation of the alarm logic |
| Fail\_To\_Stop | Mandatory | *Tagname.*DA\_XF | Fail to Stop Alarm | N/A |
| Uncommanded\_Start\_Enable | Mandatory | *Tagname.*PB\_SF | Uncommanded Start Enables | N/A |
| Uncommanded\_Start\_Mask | Optional | *Tagname.*ADDON.Uncommanded \_Start\_Mask | Uncommanded Start Alarm Mask | Program external to the AOI with conditions that should inhibit the evaluation of the alarm logic |
| Uncommanded\_Start | Mandatory | *Tagname.*DA\_SF | Uncommanded Start Alarm | N/A |
| Uncommanded\_Stop\_Enable | Mandatory | *Tagname.*PB\_XF | Uncommanded Stop Enables | N/A |
| Uncommanded\_Stop\_Mask | Optional | *Tagname.*ADDON.Uncommanded \_Stop\_Mask | Uncommanded Stop Alarm Mask | Program external to the AOI with conditions that should inhibit the evaluation of the alarm logic |
| Uncommanded\_Stop | Mandatory | *Tagname.*DA\_XF | Uncommanded Stop Alarm | N/A |
| Dialer\_Trigger | Optional | *Tagname.*ADDON.Dialer\_Trigger | Alarm Dialer Trigger | Use in a dialer routine to trigger callout of any alarms associated with the Motor |
| Interlock | Optional | *Tagname.*ADDON.Interlock | External Failure Operational Interlock | Program external to the AOI to inhibit operation based on state of hardwired alarms or other device tags |
| Failed\_Alarm\_Status | Optional | *Tagname.*ADDON.Failed\_Alarm\_Status | Indicates the presence of a virtual or hardwired device fault | Signal can be used as an interlock input to other devices or within ACP programming for failure handling |
| Auto\_Speed\_Setpoint | Optional | *Tagname.*ADDON.Auto\_Speed\_Setpoint | Automatic Speed Setpoint | Programmed outside AOI according to automatic control requirements |
| Manual\_Speed\_Setpoint | Mandatory | *Tagname.*SI\_CT | Manual Speed Setpoint | N/A |
| Speed\_Setpoint\_Min | Optional | *Tagname.*ADDON.Speed\_Setpoint\_Min | Minimum allowable Operating Speed | Program outside of AOI to implement a minimum allowable speed setpoint |
| Speed\_Out\_Min | Optional | *Tagname.*ADDON.Speed\_Out\_Min | 4 mA Speed Value | Implement in conjunction with SCALE\_CV |
| Speed\_Out\_Max | Optional | *Tagname.*ADDON.Speed\_Out\_Max | 20 mA Speed Value | Implement in conjunction with SCALE\_CV |
| Speed\_Out | Mandatory | *Tagname.*AO\_CV | Speed Command | Implement in conjunction with SCALE\_CV |
| Auto\_Stroke\_Setpoint | Optional | *Tagname.*ADDON.Auto\_ Stroke\_Setpoint | Automatic Stroke Setpoint | Programmed outside AOI according to automatic control requirements |
| Manual\_ Stroke\_Setpoint | Mandatory | *Tagname.*SI\_CK | Manual Stroke Setpoint | N/A |
| Stroke\_Setpoint\_Min | Optional | *Tagname.*ADDON. Stroke\_Setpoint\_Min | Minimum allowable Operating Stroke | Program outside of AOI to implement a minimum allowable Stroke setpoint |
| Stroke\_Out\_Min | Optional | *Tagname.*ADDON. Stroke\_Out\_Min | 4 mA Stroke Value | Implement in conjunction with SCALE\_SK |
| Stroke\_Out\_Max | Optional | *Tagname.*ADDON. Stroke\_Out\_Max | 20 mA Stroke Value | Implement in conjunction with SCALE\_SK |
| Stroke\_Out | Mandatory | *Tagname.*AO\_SK | Stroke Command | Implement in conjunction with SCALE\_SK |
| System\_Day\_Reset | Mandatory | SYS\_Day\_Reset | Reset tag for daily statistics | N/A |
| System\_Monthly\_Reset | Mandatory | SYS\_Month\_Reset | Reset tag for monthly statistics | N/A |
| Alarm\_Acknowledge | Mandatory | *Tagname*.PB\_AR | Alarm Acknowledge and Reset | N/A |
| Global\_Acknowledge | Optional | *Tagname*.ADDON.Global\_Acknowledge | Alarm Acknowledge and Reset | Reserved for Future Use with a Global Alarm Reset Pushbutton. To be programmed outside of the AOI. |
| Runtime\_Reset | Mandatory | *Tagname.*PB\_RT | Runtime Hours and Start Counters Reset | N/A |
| Runtime\_Hours | Mandatory | *Tagname.*AI\_RT | Runtime Hours | N/A |
| Out\_TotalStarts | Optional | *Tagname.*Addon.Out\_TotalStarts | Total Motor Starts Since Last Reset | Map outside the AOI to *tagname*.AI\_MX for SCADA use, if required |
| Out\_DailyStarts | Optional | *Tagname.*Addon.Out\_DailyStarts | Total Motor Starts Today | Map outside the AOI to *tagname*.AI\_TD for SCADA use, if required |
| Out\_MonthlyStarts | Optional | *Tagname.*Addon.Out\_MonthlyStarts | Total Motor Starts This Month | Map outside the AOI to *tagname*.AI\_MT for SCADA use, if required |

**AOI Operation Description**

The AOI performs the following functions:

* Executes alarm simulation logic
* Checks for disabled alarms.
* Executes Mode and Start/Stop Control Logic
* Executes Alarm Logic
* Evaluates starts and runtime
* Performs Speed Setpoint Evaluation Logic
* Performs Stroke Setpoint Evaluation Logic
* Perform check of alarm enable statues for indication of any disabled alarms
* Set the dialer bit for any configured alarms
* Setting of “last scan” values and reset of any pushbutton values

**Programming Examples**

This AOI may be used with the following types of devices:

* Single Speed Motors with No Feedback
* VFDs or Chemical Dosing Pumps with Speed or Stroke Feedback
* Chemical Dosing Pumps with Speed and Stroke Feedback

It is not necessary to hard code unused AOI parameters as the AOI can process the logic without any impact to other functions in use. As with other AOIs Dialer Alarm enables should be programmed to stay permanently disabled if they are not intended to trigger the dialer.

For devices with feedback, the Speed and Stroke Outputs are intended to be mapped into the Analog Input driver as the Scaled Setpoint Value for the purposes of evaluating the deviation alarm.

**HMI Integration**

This AOI is primarily intended for use with the following pop-ups:

* Chemical Pump Control v1\_0
* Motor Control Dual Feedback v1\_0
* Motor Control v1\_0

HMI objects that reference the motor driver can be easily modified by selecting the object and performing a Substitute Tag operation to replace the placeholder tags with the correct device tagging. Graphical motor objects are located on the “Symbols Library – Motors I” and “Symbols Library – Motors II” screens in the InTouch baseload and are labelled accordingly based on the default configuration. The list of available objects is not comprehensive and depending on the application some modifications to graphics may be required, e.g. a smaller pump body for a VFD is needed. The programmer should contact the SCADA group and discuss the requirements to ensure that the object is properly configured for use.

A motor device may have speed control/feedback, stroke control/feedback, or both. Generally speaking it is assumed that if there is only one feedback signal it is speed. However, it is possible that this signal could be stroke. Although the indirect action scripts appear to segregate tags by speed and stroke, it is more appropriate to think of the indirect speed tags as “first” feedback units, and the stroke tags as “second” feedback units. If the motor only has one feedback signal, they should be mapped to the indirect speed tags, regardless of whether this signal is speed, stroke, or some other type of feedback. If the pump only has stroke feedback, and the indirect stroke tags are used, the pop-ups that are only configured for use with single feedback systems will not work properly as they are expecting the stroke signals to be used. In either scenario, an analog input driver is required to generate the necessary stroke/speed feedback signals for the system.

The following settings must be manually configured in the pop-up script as required:

For devices that do not have feed and/or stroke feedback, mapping to the indirect tags in those sections should be replaced with “”.

PMP\_VIS1 – sets visibility for speed/stroke feedback controls and indicators. Set to 0 if device has no speed/stroke feedback.

PMP\_VIS2 – Set to 1 if motor is only monitored from SCADA and does not have plant-manual control

PMP\_VIS3 – Controls visibility of chemical pump start/stop controls/ Set to 0 if chemical pump does not have start/stop control from SCADA.

PMP\_VIS4 – Controls visibility of speed/stroke setpoint controls and indicators. Set to 0 if device does not have a speed/stroke setpoint.

PMP\_SRV – If the device is located on a remote InTouch Server, then this indirect tag must be changed to point at that server. By default, it looks at the Hot Backup Pair Configuration for the local system.