

Limitorque® TriVAX® Compact Scotch Yoke Electrohydraulic Valve Actuator Operating angle 90°



Get the benefits of two leading actuator technologies in one

The Limatorque TriVAX Compact Scotch Yoke actuator combines the infrastructure simplicity of electric actuators with the key advantages of hydraulic actuators, including mechanical fail-safe action, high operating speeds and high operating torques.

Installation is simple because the actuators only require electric power — no high-pressure oil system is necessary. The actuator's self-contained oil system operates under vacuum conditions with zero leakage, reducing contamination and eliminating the need for external piping.

Fully integrated operation and diagnostic tools are available, making it very easy to integrate safety functions or quick-operation features. The TriVAX actuator also offers you industry-leading versatility, with the ability to assemble it in any position.

Designed for safety

TriVAX Compact Scotch Yoke valve actuators are available in fail close- and fail open-spring return configurations. The operating spring-ending force for linear actuators is between 4 to 16 kN, while quarter-turn actuators are able to apply spring-ending torques from 500 to 6000 Nm. They're suitable for hazardous areas requiring protection levels to ATEX II 2 G/D Ex d IIC T4/IP67. The standard weather protections are IP65 and IP67.

Electric power, hydraulic performance

The TriVAX Compact Scotch Yoke actuator is a fully integrated actuator with a hydraulic spring cylinder driven by a high-pressure electrohydraulic power unit. The spring is coupled to the motor drive train during normal operation, but can also disengage to intervene in fail-safe scenarios. The actuator is operated by an electronic control unit with an intuitive, user-friendly, human-machine interface (HMI) that remains upright in any configuration.

Features

- Completely self-contained, zero-leakage hydraulic system
- Compact design
- Tubeless architecture
- Integrated safety functions (fail-safe/ESD)
- Simple installation
- Assemble in any position
- Low electric power consumption
- Separate terminal compartment
- Modular construction

Benefits

- Plug and work — easy installation and intuitive handling
- Reliable and efficient operation
- Diverse application possibilities with a single product platform

Characteristics

Operating voltage	3 ph/400 V/50/60 Hz For all other voltages, contact manufacturer.
Tolerances	Voltage $\pm 10\%$; frequency: $\pm 5\%$
Power consumption	770 W at 50 Hz 930 W at 60 Hz
Position accuracy	$\pm 2\%$ of control range/full stroke (positioning)
Ambient temperature	-25°C to 70°C (-13°F to 158°F)
Protection class	IP 65/IP 67
Explosion protection	ATEX Ex II2G/D EEx d IIC T4/IP67
Corrosion protection	DIN EN ISO 12944-2 category C3 (medium) Optional: DIN EN ISO 12944-2 category C5M
Manual operation	Hand pump (optional)
Mounting position	Each position possible
Maintenance period	5 years / up to 10,000 cycles (switching) / 1,800,000 starts (positioning) Number of cycles / starts depends on actuator size
Lifetime	10 years / 2x DIN EN 15714-2 (up to 20,000 cycles / 3,600,000 starts)
SIL	SIL 2 for FS mechanic SIL 3 for systemic integrity

Inputs/outputs and actuator sizes

Control Configuration	On/Off
Inputs	4 x digital input 24 V DC (solid state) externally powered Open / Stop / Close Function programmable 1 x Input ESD (function: 1oo1)
Outputs	4 x Relais output programmable 1 x monitor-Relais (change-over-contact) 1 x output (change-over-contact) ESD ready
Auxiliary voltage	24 V DC / 200 mA to supply the digital inputs; isolated from internal electronics
Optional modules	Module with four additional digital outputs (programmable) Analog output 4-20 mA (position retransmission) 2 x input ESD (function: 1oo2) 3 x input ESD (function: 2oo3)

Control Configuration	Positioning
Inputs	4 x digital input 24 V DC (solid state) externally powered Open / Stop / Close Function programmable 1 x input ESD (function: 1oo1) 1 x analog input 4-20 mA (setpoint position)
Outputs	4 x Relais output programmable 1 x monitor-Relais (change-over-contact) 1 x output (change-over-contact) ESD ready 1 x analog output 4-20 mA (position retransmission)
Auxiliary voltage	24 V DC / 200 mA to supply the digital inputs; isolated from internal electronics
Optional modules	Module with four additional digital outputs (programmable) Bus systems: in preparation 2x input ESD (function: 1oo2) 3x input ESD (function: 2oo3)

Actuator Size Scotch Yoke	2001	2002	2003	2004	2005
Torque quarter-turn [Nm] spring ending	434 Nm	910 Nm	1861 Nm	3911 Nm	5518 Nm
Operating angle	90° / mechanically adjustable +/- 5° in each end position				
Operating time t_{standard} @ 90°	15 sec	15 sec	29 sec	60 sec	110 sec
Fast operating @ 90°	< 1 sec / 90°	< 1 sec / 90°	< 1 sec / 90°	< 2 sec / 90°	< 3 sec / 90°

Control configuration

Control Configuration	On/Off
Functional scope	Open/Close
Duty cycle	S2 – 10 min
Intuitive human-machine interface	Selector switch local/off/remote (padlockable) 4 x soft-key-push-button Display for visualization of actuator status, configuration and parametrizing, diagnostics

Digital inputs/outputs

Digital inputs	4 (24 VDC) Configurable for latched operation, push-to-run operation or two-wire control 1 x ESD (1001)
Digital outputs	4 relay outputs – volt-free Configurable as "make" or "break" contacts for status signals 1 x monitor Relais (change-over-contact) 1 x ESD ready (change-over-contact)
Position detection	✓
Mech. position indication	Beacon
Junction box	Junction box to connect all components electrically
Manual operation	Option
Quick-acting, spring-return function	Option
Ex proof (ATEX)	Option
Analog output	Option

Control Configuration	Positioning
Functional scope	Positioning
Duty cycle	S4 – 25%
Position accuracy	2% full stroke
Intuitive human-machine interface	Selector switch local/off/remote (pad-lockable) 4 x soft key push-button Display for visualization of actuator status, configuration and parametrizing, diagnostics

Digital inputs/outputs

Digital inputs	4 (24 VDC) Configurable for latched operation, push-to-run operation or two-wire control 1 x ESD (1001)
Digital outputs	4 relay outputs – volt-free Configurable as "make" or "break" contacts for status signals 1 x monitor Relais (change-over-contact) 1 x ESD ready (change-over-contact)

Analog inputs/outputs

Analog input	1x 4-20 mA
Analog output	1x 4-20 mA

Control configuration

Control Configuration	Positioning
Position detection	✓
Mech. position indication	Beacon
Junction box	Junction box to connect all components electrically
Manual operation	Option
Quick-acting, spring-return function	Option
Ex proof (ATEX)	Option
Fieldbus	Option (in preparation)

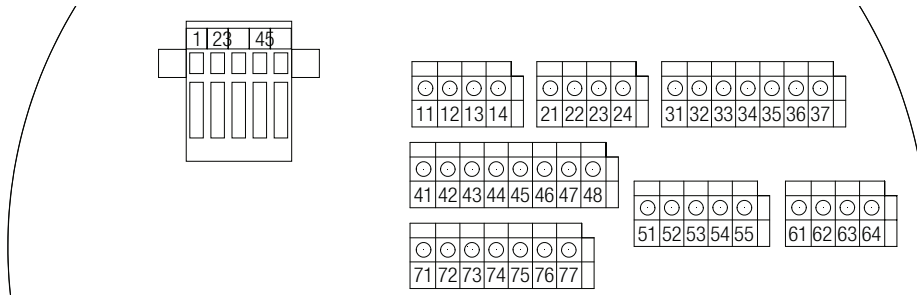
Availability Control Function/Function		
Function	Functional Scope Control	
	On/Off	Positioning
Open/Close	✓	✓
Positioning	–	✓
Digital inputs	✓	✓
Digital outputs	✓	✓
Analogue input	–	✓
Analogue output	○	✓
Auxiliary voltage	✓	✓
Human-machine interface	✓	✓
Mech. position indication	✓	✓
Position detection	✓	✓

Availability Control Function/Option		
Option	Functional Scope Control	
	On/Off	Positioning
Manual operation	○	○
Additional digital outputs	○	○
Fieldbus	–	in preparation
Ex proof (ATEX)	○	○
SIL	○	○
Quick-acting, spring-return function	○	○
Ambient temperature: arctic	in preparation	in preparation

Legend:

- ✓ Available as standard
- Available as an option on special request
- Not available

Terminal block



Terminal block

Operating voltage — terminals 1–5

L1-L2-L3 + ground wire + N

Digital inputs and aux. voltage — terminals 31–37

Digital inputs 1–4 Assignments depend on configuration	Launched operation	DI1: open DI2: close DI3: stop DI4: configurable
	Push-to-run operation	DI1: open DI2: close DI3: configurable DI4: configurable
	Two-wire control	DI1: control input open/close DI2: configurable DI3: configurable DI4: configurable
Aux. voltage	24 V DC, max. 200 mA	

ESD inputs/outputs — terminals 71–77

ESD IN — 1–3 input 24 V DC	1oo1: At low signal, ESD will be released. Option 1: 1oo2: At low signal at minimum one input, ESD will be released. Option 2: 2oo3: At low signal at minimum two inputs, ESD will be released.
ESD ready out change-over relay	When ESD monitoring is active, a message is displayed, which means changeover relay.

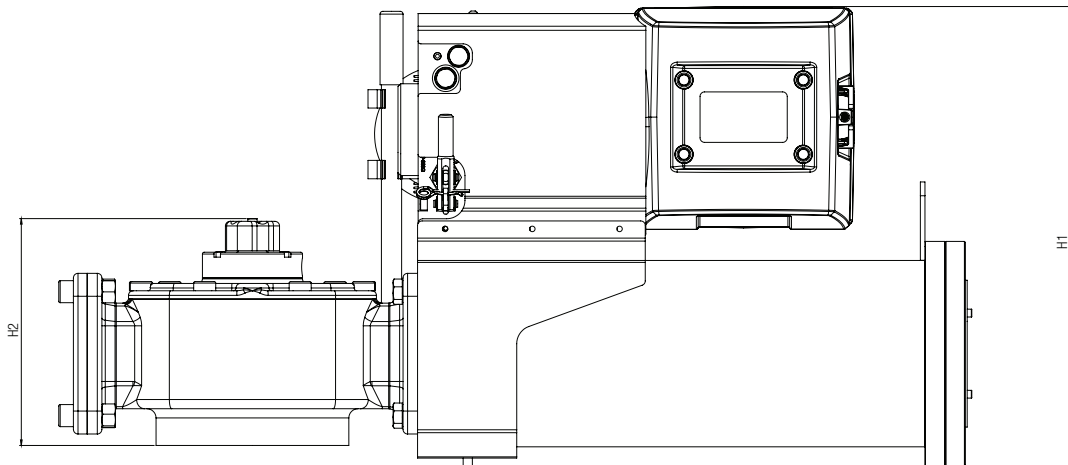
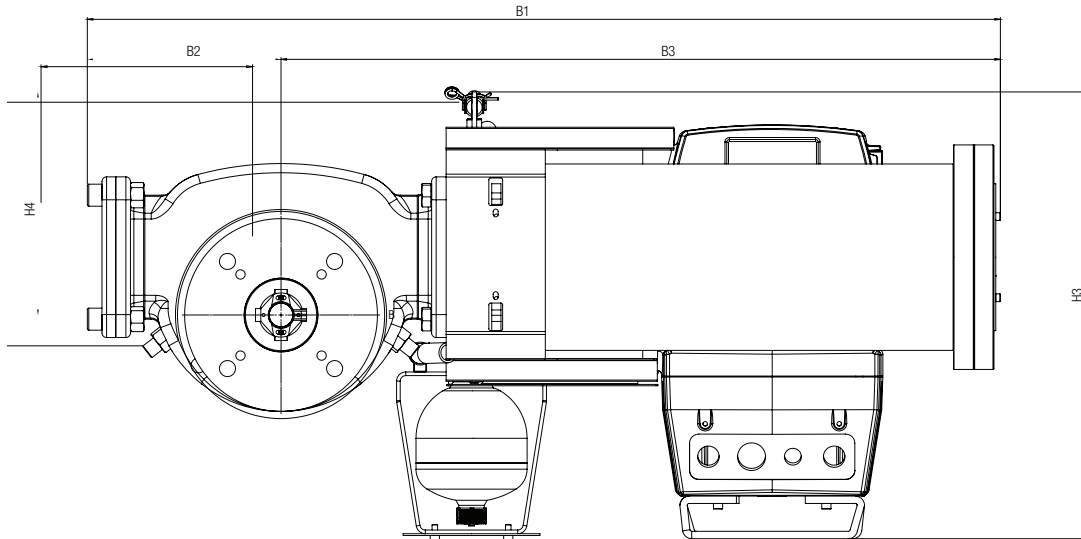
Volt-free outputs — terminals 41–48

Digital inputs 1–4 Assignments depend on configuration	Default values	DO1: end pos. OP
		DO2: end pos. CL
		DO3: actuator moves
		DO2: selector switch local
Monitor relay	A message displayed means changeover relay, when remote control of actuator is not possible.	

Analog inputs/outputs — terminals 11–14

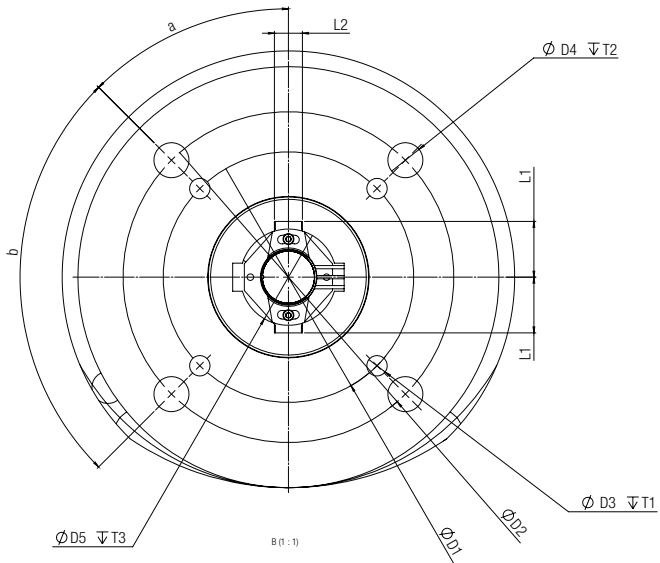
Analog input	Setpoint of actuator position
Analog output	Retransmission of actual actuator position

Dimensions



Size	B1	B2 (mm)	B3	H1	H2	H3	H4	D1	D2	D3 x T1	D4 x T2
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
1	994	211	604	500	247	483	240	125	165	4 x M12 x 20	4 x M20 x 30
2				500							
3				515							
4	1440	314	1126	690	351	307	254	298	8 x M16 x 24	8 x M20 x 30	
5				690							

Dimensions – connecting flanges



D5 x T3	L1	L2	Weight
(mm)	(mm)	(mm)	(kg)
48 x 170	28	14	174
			181
			191
98 x 265	55	28	450
			475

Possible configurations – interfaces and diagnostics

Digital inputs

Block local operation	Configurable as active high or low outputs
Start partial stroke test	
Error ack	
Interlock remote	

Volt-free inputs

Calibration complete	Configurable as active high or low outputs
Local blocking active	
Position open	
Position closed	
Actuator moves	
Failure	
Maintenance required	
Out of specification	
Functional check	
Selector local	
Selector remote	
Selector null	
Partial stroke test not OK	
Partial stroke test active	
Partial stroke test OK	
Actuator ready	

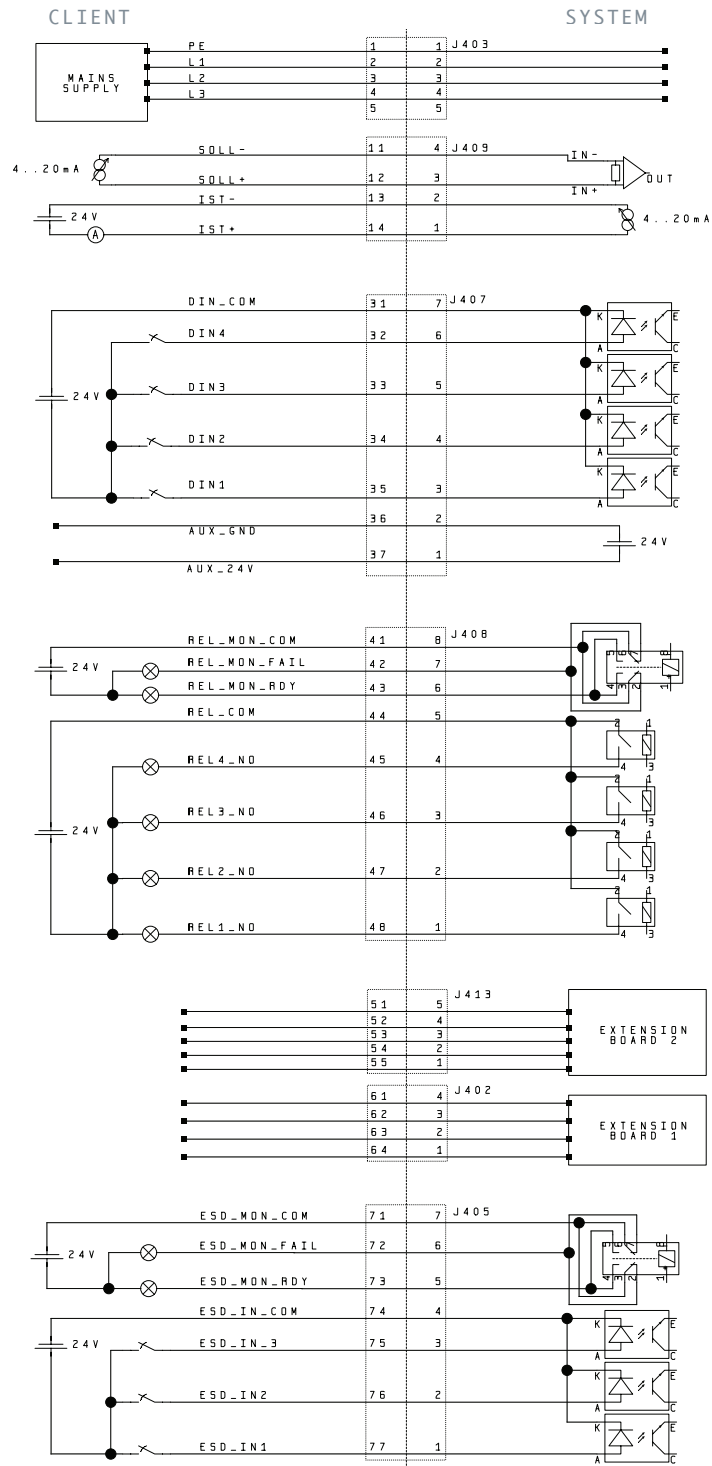
Analog input

Threshold control	
Positioner	

Partial stroke test

PST direction	Open or close
PST stroke	3 – 99%
PST reference value TriVAX 1300	Ref. characteristic/max. limit
PST tolerance	0 – 100%
PST activation	Control room/time interval 1 – 999 days

Wiring proposal



Ordering code

TriVAX

Code	Description	Comment
TX		


Actuator

1	TriVAX compact linear	
2	TriVAX compact quarter-turn	Scotch yoke

Function

2	On/Off	
3	Positioning	

Safety Function

4	FS mechanic OP — ESD 1oo1	Linear: CL = piston extended Quarter-turn: clockwise to close
5	FS mechanic CL — ESD 1oo1	
6	FS mechanic OP — ESD disabled	
7	FS mechanic CL — ESD disabled	Linear: CL = piston retracted Quarter-turn: counter-clockwise to close
9	FS mechanic OP invers — ESD 1oo1 	
0	FS mechanic CL invers — ESD 1oo1	
A	FS mechanic OP invers — ESD disabled	
B	FS mechanic CL invers — ESD disabled	
C	FS mechanic OP invers — ESD 1oo2	
D	FS mechanic CL invers — ESD 1oo2	Linear: CL = piston extended Quarter-turn: counter-clockwise to close
E	FS mechanic OP invers — ESD 2oo3	
F	FS mechanic CL invers — ESD 2oo3	
K	FS mechanic OP — ESD 1oo2	
L	FS mechanic CL — ESD 1oo2	
M	FS mechanic OP — ESD 2oo3	
N	FS mechanic CL — ESD 2oo3	

Operating Force/Size

	Linear	Quarter-turn
1	4 kN	500 Nm
2	8 kN	1000 Nm
3	16 kN	2000 Nm
4		4000 Nm
5		6000 Nm

Ordering code

Stroke

Code	Description	Comment
–	Quarter-turn actuator, 90°	
D	150 mm	
F	300 mm	

Voltage

1	3 ph / 400V / 50/60 Hz	Not yet available
2	1 ph / 230V / 50/60 Hz	
3	3 ph / 480V / 50/60 Hz	
4	1 ph / 110V / 50/60 Hz	

Protection Class/Approval

A	SIL / IP65	
B	SIL / ATEX	
M	IP65	
N	ATEX	

Temperature Range

1	Standard	-25°C to 70°C (-13°F to 158°F)
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Fieldbus/Remote Control

0	Without	
A	Module: four volt-free outputs	
B	Module: 1 analog output	
C	Module combination: A + B	

Ordering code

Mounting Orientation Cable Entries

Code	Description	Comment
A	0°	Standard quarter-turn
B	90°	Standard linear
C	180°	
D	270°	

Optional Features

0	Without	
1	Hand pump	
2	Trip	Quick-acting, spring-return time (adjustable)
3	Hand pump + trip	

Electric/Mechanic Connection

1	Cable entry metric / mech. connection standard (see dimensional drawing)
5	Cable entry NPT (with adaptors) / mech. connection standard (see dimensional drawing)

Corrosion Protection

1	Standard	Acc. ISO 12944-2 C3
2	Off-shore	Acc. ISO 12944-2 C5M
6	Special color	Customized





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