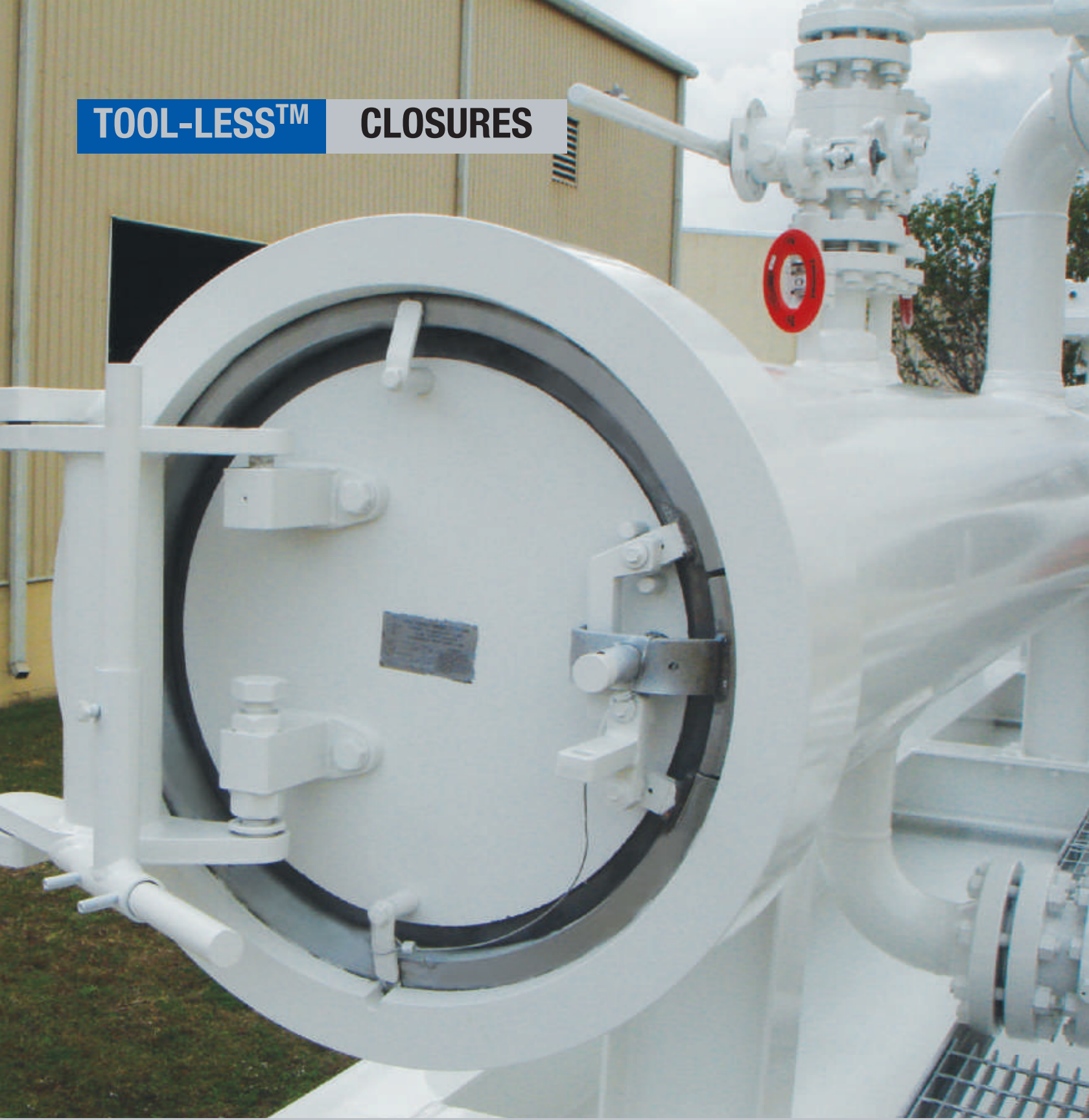
TOOL-LESS™ CLOSURES



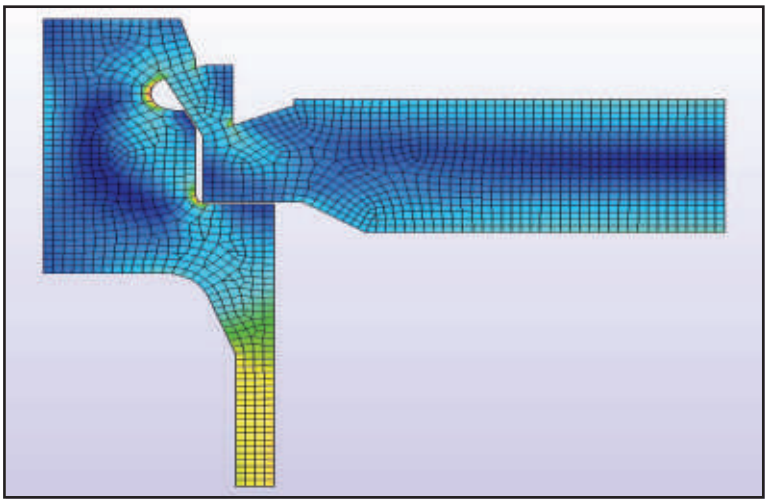
For Blanking Off
Pipeline Ends,
Tank and
Vessel Openings

SYPRIS® TECHNOLOGIES
Tube Turns Division

HISTORY

Tube Turns was founded in 1927 in Louisville, Kentucky, US as the first American manufacturer of forged seamless pipe elbows and returns. Over the years we have expanded our production capabilities to keep pace with the changing piping requirements of the industries we serve. In the 1960's we expanded our product line to include Engineered Products which are manufactured and designed to customer requirements.

More and more piping engineers and equipment designers in the oil and gas industry are specifying extremely quick opening type closures that do not require tools. Applications include scraper traps, filters, strainers, separators/coalescers, terminal manifolds, meter provers, distillation towers, storage tanks or any pressure vessel requiring frequent access. We are now pleased to introduce our newest closure product line, the Tool-less™ closure.



Design of the Tool-less closure has been verified using the latest finite element analysis software.

DESIGN

The Tool-less™ closure satisfies design requirements in ASME B31.3, B31.4, B31.8, and Section VIII, Div. 1. The entire design has been verified through proven stress calculations, the latest finite element analysis software, and strain gage testing, establishing a high level of confidence in the structural integrity of the Tool-less™ closure. In addition, fatigue analysis based on severe field condition data has been successfully conducted on all closure sizes and classes.

FAST, EASY OPERATION

Tool-less™ operation is smooth and direct and even the largest unit can be opened or closed in a matter of seconds by one person. Complete installation, operating and maintenance instructions are furnished with each Tool-less™ closure.

SAFETY

Our Pressure Warning Device (PWD) assures both pressure warning and mechanical locking of the closure prior to commencement of operation. Additionally, the PWD serves the purpose of alerting the operator to any residual pressure inside the vessel should the operator inadvertently attempt to open the closure before all pressure has been relieved. Tool-less™ closure safety system meets the requirements of UG-35.

CONFIGURATION

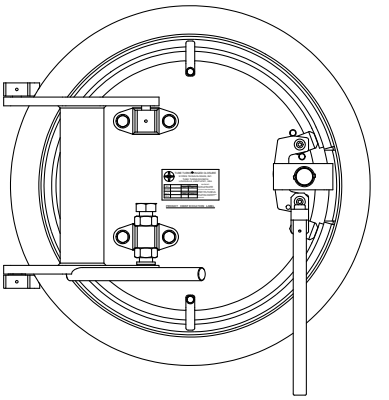
Tool-less™ closure is available in horizontal and vertical configurations. Horizontal closures include a robust double pivot adjustable hinge. Vertical closures can be offered with a davit or lifting lugs depending on closure size and customer preference.

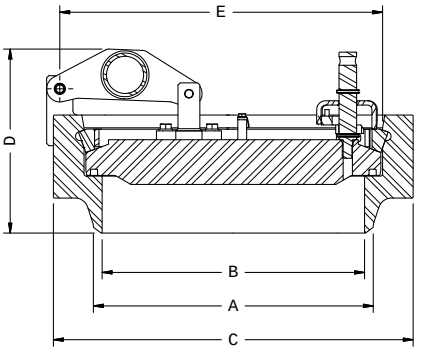
CLOSURE DIMENSIONS

A	B	C	D	E	WEIGHT (LBS)	
NOM SIZE	HUB ID	HUB OD	OVERALL HEIGHT	SWING RADIUS	HEAD	TOTAL
8	7.98	12.10	5.62	10.36	27	90
10	10.02	14.75	6.22	12.86	48	142
12	12.00	17.00	6.73	15.21	78	209
14	13.00	18.50	7.55	16.39	102	276
16	15.00	21.00	7.82	18.41	150	368
18	17.00	23.00	8.21	20.40	212	479
20	19.00	25.50	8.85	22.62	288	643
22	20.87	28.00	9.42	24.66	382	830
24	22.62	30.00	10.15	26.40	478	1021
26	24.50	32.50	10.90	28.45	607	1297
28	26.50	35.00	11.22	30.50	757	1566
30	28.50	37.00	11.60	32.48	930	1852
32	30.25	40.00	12.98	34.63	1128	2357
34	32.25	42.00	13.29	36.68	1352	2753
36	34.00	44.50	14.18	38.68	1605	3280
38	36.00	47.00	14.70	40.74	1885	3825
40	38.00	49.00	14.91	42.22	2119	4111
42	39.50	50.50	16.25	43.72	2369	4692
44	41.50	53.00	16.56	45.69	2734	5317
46	43.50	55.00	16.82	47.64	3134	5933

UNITS ARE IN INCHES AND ARE APPROXIMATE

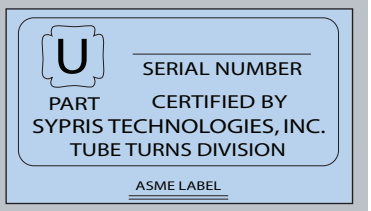
ANSI CL600 TOOL-LESS™





DIMENSIONS FOR ANSI CL900, CL1500 AND LARGER SIZES ARE AVAILABLE UPON REQUEST

CLOSURE MATERIALS



Tube Turns offers the Tool-less™ closure with optional "U" stamp and Form U-2A Partial Data Report for a nominal fee. This ensures that our products will meet your most stringent requirements.

MATERIALS OF CONSTRUCTION

We maintain an inventory of ASME compliant components in carbon and stainless steel including low temperature and high yield materials to accommodate quick delivery. Materials conforming to the latest NACE requirement standard MR-01-75, duplex, other specialty alloys, weld overlays are available upon request.

CORROSION RESISTANT WELD OVERLAY

Weld overlay of the sealing surfaces can be provided in a variety of corrosion resistant alloys.

LIP SEAL

Designed for long life, each Tool-less™ closure is furnished with a pressure energized lip seal with stainless steel backing ring located in the closure door or hub depending on closure orientation. Standard lip seal material is a fully molded "Buna-N"; optional seal materials are available.

SYPRIS® TECHNOLOGIES
Tube Turns Division

DESIGN VALIDATION

FINITE ELEMENT ANALYSIS AND STRAIN GAGE TESTING

The Tool-less™ closure product line has been designed in accordance with ASME Section VIII, Division 1, B31.3, B31.4, and B31.8 using finite element analyses. All pressure retaining components are designed for long life and verified through fatigue analysis.

Furthermore, strain gage testing was performed in accordance with ASME Section VIII, Division 1, UG-101 for various sizes and classes. The results obtained through strain gage testing were compared to finite element analysis for theoretical agreement and meet the allowable stresses prescribed in the ASME Pressure Vessel Code. All strain gage testing was witnessed by independent authorized inspection agency.

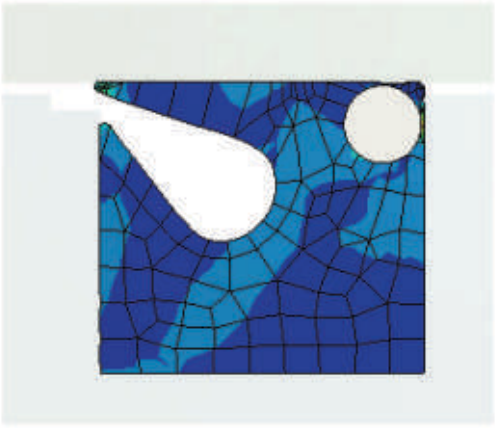
Strain Gage Testing

PRESSURE FATIGUE TESTING

A 36" Class 600 Tool-Less™ closure was subjected to hydrostatic pressure fatigue test of 100 rapid pressure cycles ranging from 1480 to 2250 and showed no signs of leaking, deforming, or yielding.

LIP SEAL VALIDATION

The Tool-less™ closure lip seal was developed using FEA. This allowed for the behavior and the stresses of the seal to be examined before physical testing. We have analyzed the seal at the worst case scenarios to ensure that the seal will successfully perform in the closure. The seal has been successfully tested in the closure.



FEA Analysis of Lip Seal

ADVANTAGES

Simple and Quick Operation
Operation of closure requires no tools and opens and closes in a matter of seconds by one person.

Low Maintenance
Designed to be durable and minimize spare parts.

Actuation
Robust and fatigue resistant actuation increases leverage transfer and life.

Safety
Positive mechanical locking prevents accidental opening under pressure. Complete with pressure warning device in accordance with UG-35.

Economical and Available
Competitive pricing and inventoried materials.

Fully Molded Seal
Eliminates need for splicing resulting in higher strength and longer life.

Integrated Backing Spring
One piece construction simplifies installation and reduces spare parts required.

QUALITY CONTROL

The Tool-less™ closure is manufactured in Louisville, KY, USA. The Tube Turns Division quality system meets the American Society of Mechanical Engineers- Boiler and Pressure Vessel Code, Section VIII, Division 1, Appendix 10 standard. The quality system is audited by an independent authorized inspection agency.

The quality system controls order analysis, calibration, drawings, documents, materials, processes, welding, nondestructive examination and inspection.

Raw materials are inspected for dimensional acceptability and proper heat code identification. Mill test reports are checked to ensure proper physical and chemical properties of all pressure retaining components. Certified material test reports are shipped with each closure.

A serial number is assigned to each Tool-less™ at order entry and is permanently stamped on the closure.

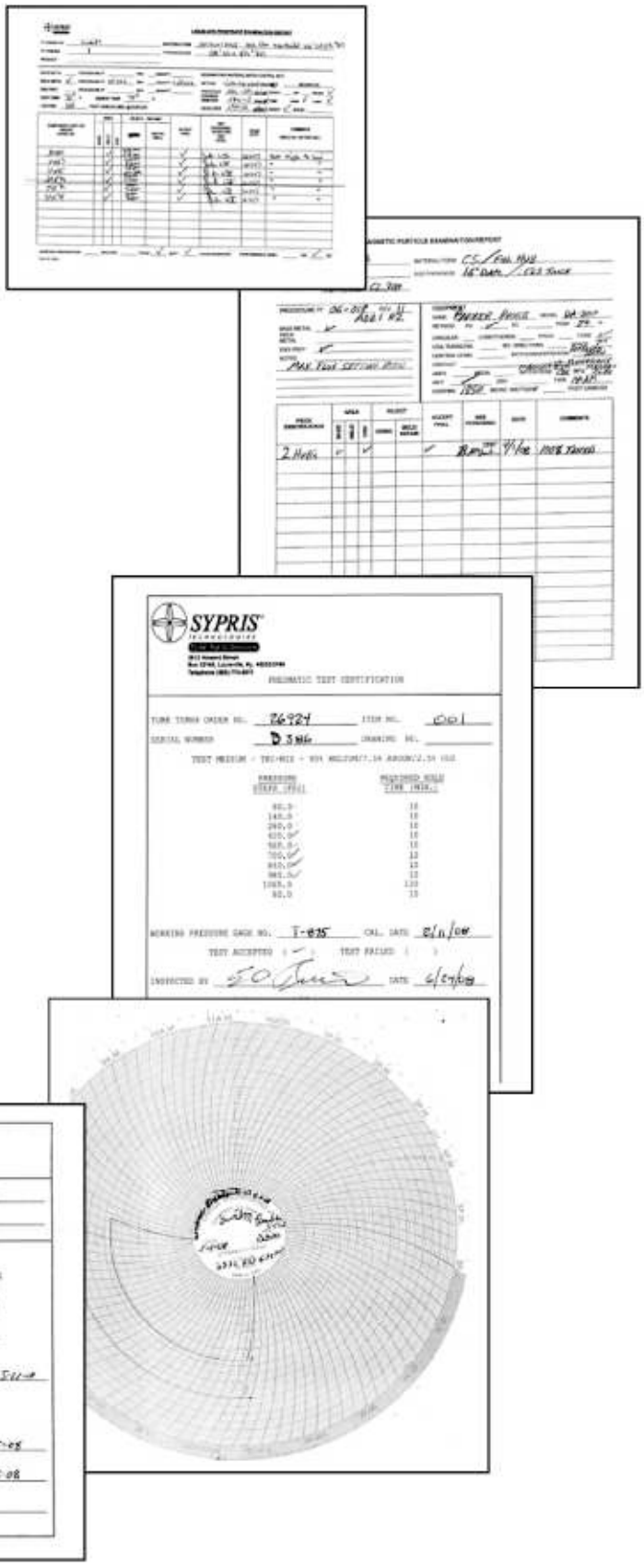
The actual heats of material used for the individual closures are permanently recorded and stamped on all pressure retaining components. This provides traceability to the material test reports for every closure.

The Tube Turns Division can meet the most stringent customer material and testing requirements. Special customer requirements are evaluated by the engineering department.

The Tube Turns Division offers optional hydrotest and helium leak test. Nondestructive examination per ASME Section V is available in-house and includes radiography, ultrasound, magnetic particle, and liquid penetrant.

When specified, the following documents are furnished for each closure

- Hydrostatic test certification
- Nondestructive test reports
- ASME code stamping available upon request



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TECHNOLOGIES
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36” CL600 Tool-less™ Closure in Production.