ESSEM WORKS PVT. LTD.

AHMEDABAD, INDIA · ISO 9001 : 2015 · ISO 14001 : 2015 · ISO 45001 : 2018

LIFELINE OF EVERY INDUSTRY

# PRODUCT CATALOGUE 2026

Precision-engineered stainless-steel flexible flow solutions for the world's most demanding process industries — designed, manufactured & certified at our Ahmedabad works.



CORRUGATED DN6-DN350

INTERLOCK DN6-DN200

BELLOWS DN50-DN3000

LIFELINE OF EVERY INDUSTRY

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03 / ABOUT ESSEM WORKS

# The lifeline of every industry.

Essem Works Pvt. Ltd. manufactures precision stainless steel flexible flow solutions from its works in Ahmedabad, Gujarat, India. We supply SS corrugated hoses, interlock hoses, and bellows & expansion joints to industries including chemical, oil & gas, power generation, pharmaceutical, food & beverage, and process engineering worldwide.

Supported by experienced engineers and advanced manufacturing infrastructure, Essem Works combines technical expertise with consultative service — delivering standard and fully custom solutions from DN6 to DN3000. Every product is manufactured to international standards, 100% pressure-tested in-house, and fully traceable from raw material mill certificate to dispatch documentation.

FACILITY
**32,000** sq.ft.
Built-up works, Moraiya, Ahmedabad

SIZE RANGE
**DN6** to **DN3000**
Instrument line to 3 m bellows

PRODUCT FAMILIES
**3**
Corrugated · interlock · bellows

CERTIFIED
**ISO 9001 · 14001 · 45001**
TÜV Rheinland

— MANUFACTURING CAPABILITY —

| | |
|---|---|
| **Corrugated hose range** | DN6 (¼") to DN350 (14") — Mechanically Formed DN6–DN50 · Hydroformed DN20–DN300 |
| **Interlock hose range** | DN6 to DN200 — Double Interlock, Loose Interlock, Polygonal (larger sizes on request) |
| **Bellows & expansion joints** | DN50 to DN3000 — single, universal, hinged, gimbal, pressure-balanced |
| **Standard materials** | SS 304L / 316L held in stock — SS 321 to order |
| **Design standards** | ISO 10380 · EJMA (11th Ed.) · EN 14917:2021 |
| **In-house testing** | 100% pneumatic leak test on every assembly; hydrostatic (1.5× working pressure), burst & fatigue-cycle testing to customer requirement |

**From a 6 mm instrument line to a 3 m bellows — every assembly leaves pneumatically tested.**

100% PRESSURE TESTED · TRACEABLE MILL CERT → DISPATCH

04 / QUALITY & CERTIFICATIONS

# Certified to three international standards.

Essem Works operates an integrated management system independently audited and certified by TÜV Rheinland. Manufacturing, environmental and occupational-health practices are reviewed annually against the latest international standards.

QUALITY MANAGEMENT
**ISO 9001**
: 2015
Certified by TÜV Rheinland · Cert. No. 01 100 2437759

ENVIRONMENTAL
**ISO 14001**
: 2015
Certified by TÜV Rheinland · Cert. No. 01 104 2537285

HEALTH & SAFETY
**ISO 45001**
: 2018
Certified by TÜV Rheinland · Cert. No. 01 213 2537285

ISO 9001 · 14001 · 45001 — TÜV Rheinland. The three scopes differ; we set them out exactly → essemworks.com/quality.html

## — DESIGN & BUILD CODES —

- **EJMA (11th Ed.)** — Expansion Joint Manufacturers Association Standards
- **ISO 10380** — corrugated metal hose & assemblies (pipework)
- **EN 14917:2021** — metal bellows expansion joints for pressure applications

## — TEST & INSPECTION —

| TEST | SCOPE |
|---|---|
| Hydrostatic test | 1.5× working pressure — to customer requirement |
| Pneumatic / leak test | 100% of every assembly / hose |
| Burst test | Destructive test for new designs |
| Fatigue cycle | For engineered bellows configurations |
| NDT on request | RT · UT · PT · helium leak |
| Third-party inspection | Third-party witness inspection on request |

**DOCUMENTATION AVAILABLE WITH EVERY SHIPMENT**

Mill test certificates (EN 10204 3.1) · dimensional inspection report · pneumatic leak-test report (hydro-test report to customer requirement) · certificate of conformity · packing list · operations & installation manual

**ENVIRONMENT · ISO 14001**

Stainless offcuts segregated & recycled · certified environmental management system reviewed annually.

05 / PRODUCT SELECTION GUIDE

# Three families. One standard.

Essem Works manufactures three distinct flexible-flow product families — each engineered for a fundamentally different function. Use this guide to identify the right product for your application.

01 / PRESSURE-TIGHT

## SS corrugated hoses

DN6–DN350 · 304L / 316L (321 to order)



**CHOOSE THIS WHEN YOU NEED**

- Pressure-tight fluid or gas conveyance
- Vibration isolation at pumps / compressors
- Thermal expansion in small-bore pipework
- Flexible connection absorbing misalignment
- Full SS wetted surface for chemical service
- Temperature -196 °C to +450 °C standard

Hydroformed & mechanically formed

P. 07

02 / PROTECTIVE

## SS interlock hoses

DN6–DN200 · 304 (316L/321 to order)



**CHOOSE THIS WHEN YOU NEED**

- Flexible protective conduit / armour sleeve
- External protection over a corrugated hose
- Inner liner inside a corrugated hose bore
- Flexible exhaust or ventilation ducting
- Pneumatic conveying — bulk material lines
- Cable protection in high-temp zones

Not pressure-tight — protective use

P. 12

03 / ENGINEERED

## Bellows & expansion joints

DN50–DN3000 · EJMA/EN 14917



**CHOOSE THIS WHEN YOU NEED**

- Thermal expansion in large-bore pipework
- Seismic / settlement movement compensation
- Axial, lateral or angular movement — any plane
- Noise & vibration attenuation in piping
- Engineered product with fatigue documentation
- Custom DN, length, movement, pressure class

Calculated per order — EJMA / EN 14917

P. 13

— QUICK RULE —

Containing pressure → **corrugated** · Protecting something → **interlock** · Absorbing pipe movement → **bellows**

06 / INDUSTRIES & APPLICATIONS

# Built for every process industry.

One flexible-flow partner across your plant — from a DN6 instrument line to a DN3000 duct bellows.

| INDUSTRY | WHAT WE SUPPLY | TYPICAL APPLICATIONS |
|---|---|---|
| **Chemical & petrochemical** | 316L braided hose · PTFE-lined hose · expansion joints | Acid / solvent / alkali transfer · reactor & vessel nozzles · steam & condensate · dosing skids |
| **Pharmaceutical & API** | Sanitary tri-clamp hose (316L) · bellows | CIP / SIP lines · purified-water & WFI loops · reactor charging · clean utilities |
| **Oil & gas · CGD · CNG** | High-pressure braided hose · engineered bellows | CNG dispensers & cascades · gas skids · refinery piping · flare & vent lines · compressor isolation |
| **Power generation** | Expansion joints · high-temp hose | Main steam & feed-water · flue-gas & air ducts · HP heater connections · turbine auxiliaries |
| **Food, beverage & dairy** | Sanitary tri-clamp hose · steam hose | Milk / syrup / brine transfer · steam & hot-water CIP · brewery wort & $CO_2$ lines |
| **Steel · cement · foundry** | Interlock hose · expansion joints | Hot-gas & abrasive powder conveyance · furnace cooling-water · kiln & exhaust ducting |
| **HVAC & MEP** | Vibration eliminators · bellows | Pump & chiller connectors · chilled / hot-water risers · seismic & settlement joints |
| **Automotive & OEM** | Interlock exhaust flex · small-bore braided hose | Exhaust flex sections · EGR pipes · genset exhausts · fuel & air lines |
| **EPC & consultants** | Complete engineered packages | Project-spec bellows with EJMA / EN 14917 dossiers · TPI witness · documentation packs |

— EMERGING APPLICATIONS · ON ENQUIRY —

### Hydrogen & green energy

$H_2$ skid and electrolyser enquiries are reviewed case by case — contact EWPL engineering before specifying any assembly for hydrogen service.

### LNG & cryogenics

Austenitic grades rated to -196 °C as standard, with cryogenic end preparation.

### Semiconductor & high purity

Electropolished bore and $O_2$-clean / oil-free preparation on request.

- ISO 9001 + 14001 + 45001
- 100% pneumatically leak-tested
- 24-48 hr stock dispatch
- Custom fabrication DN6-DN3000
- EN 10204 3.1 traceability

01

PRODUCT FAMILY 01 · DN6 – DN300

# SS corrugated flexible hoses

A corrugated metal hose assembly is a thin-wall stainless steel tube formed into a precise annular (wave) corrugated profile that provides flexibility while maintaining full fluid and pressure containment. One or two layers of stainless steel wire braid are applied over the corrugated core to increase the working pressure rating and provide mechanical protection.

Compared with rubber hoses, corrugated metal hoses offer superior temperature range, full chemical resistance, zero permeation, fire safety, and significantly longer service life — the standard choice for industrial piping connections where vibration isolation, thermal flexibility, or movement compensation is required. Standard grades SS 304L · 316L held in stock; SS 321 to order.

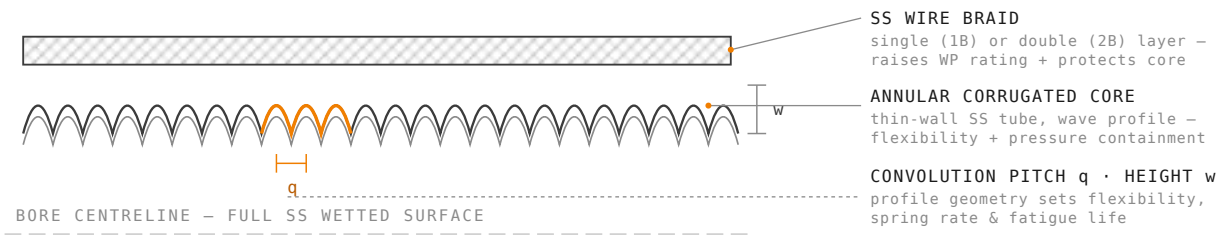



FIG. 01 — CORRUGATED HOSE CROSS-SECTION · ANNULAR PROFILE + BRAID

— TWO MANUFACTURING TYPES —

| | HYDROFORMED — DN20 TO DN300 | MECHANICALLY FORMED — DN6 TO DN50 |
|---|---|---|
| PROCESS | Straight SS tube formed by high-pressure internal fluid — wall worked evenly without thinning | Profile produced by mechanical tooling — rollers form the wave on the tube wall |
| STRENGTHS | Higher pressure performance · superior fatigue life for dynamic service · tight dimensional control, consistent spring rate | Small-bore range DN6–DN50 · flexible corrugation pitch & amplitude · cost-effective for standard pressures |
| BRAIDING | **1B single braid** — substantially raises working pressure + mechanical protection · **2B double braid** — higher pressure service, heavy-duty protection against abrasion / impact | |

08 / TECHNICAL DATA

# Corrugated hose pressure & bend data.

MATERIALS SS 304L / 316L · AT 20 °C
PRESSURES IN kg/cm² · ×0.98 = BAR
TEST = 1.5× WP · BURST ≥ 4× WP

TABLE 1 — WORKING PRESSURE & MINIMUM BEND RADIUS

| DN | SIZE | WORKING PRESSURE (KG/CM²) | | | MIN. BEND RADIUS (MM) | |
|---|---|---|---|---|---|---|
| | | HOSE ONLY | SINGLE BRAID | DOUBLE BRAID | STATIC | FLEXING (T-2) |
| DN6 | ¼" | 4 | 100 | 160 | 25 | 140 |
| DN8 | 5/16" | 4 | 100 | 160 | 32 | 165 |
| DN10 | ⅜" | 4 | 90 | 144 | 38 | 190 |
| DN12 | ½" | 3 | 80 | 128 | 45 | 210 |
| DN16 | ⅝" | 3 | 70 | 112 | 58 | 250 |
| DN20 | ¾" | 2 | 64 | 102 | 70 | 285 |
| DN25 | 1" | 2 | 50 | 80 | 85 | 325 |
| DN32 | 1¼" | 1.5 | 40 | 64 | 105 | 380 |
| DN40 | 1½" | 1.5 | 30 | 48 | 130 | 430 |
| DN50 | 2" | 1 | 28 | 44 | 160 | 490 |
| DN65 | 2½" | 1 | 24 | 38 | 200 | 580 |
| DN80 | 3" | 1 | 18 | 28 | 240 | 800 |
| DN100 | 4" | 0.8 | 16 | 26 | 290 | 1000 |
| DN125 | 5" | 0.6 | 12 | 20 | 350 | 1250 |
| DN150 | 6" | 0.6 | 10 | 16 | 400 | 1550 |
| DN200 | 8" | 0.5 | 8 | 12 | 520 | 2000 |
| DN250 | 10" | 0.25 | 6 | 9 | 620 | 2500 |
| DN300 | 12" | 0.2 | 4 | 6 | 720 | 3000 |
| DN350 * | 14" | 0.1 | 2 | 4 | 900 | 3600 |

TABLE 2 — TEMPERATURE DERATING (× WP) · ISO 10380

| MEDIA TEMP. | 304L | 316L | 321 † |
|---|---|---|---|
| -200 to -20 °C | 1.00 | 1.00 | 1.00 |
| 20 °C | 1.00 | 1.00 | 1.00 |
| 50 °C | 0.87 | 0.88 | 0.92 |
| 100 °C | 0.72 | 0.74 | 0.83 |
| 150 °C | 0.65 | 0.67 | 0.78 |
| 200 °C | 0.59 | 0.62 | 0.74 |
| 250 °C | 0.55 | 0.58 | 0.71 |
| 300 °C | 0.51 | 0.54 | 0.67 |
| 350 °C | 0.48 | 0.52 | 0.64 |
| 400 °C | 0.46 | 0.50 | 0.62 |
| 450 °C | 0.45 | 0.48 | 0.61 |
| 500 °C | 0.44 | 0.47 | 0.60 |
| 550 °C | 0.43 | 0.47 | 0.59 |

Derating factors per ISO 10380:2012 Table 3 (proof-stress basis). Working pressure at temperature = the 20 °C rating of the weakest component × the factor for the grade. 304L / 316L standard continuous service -196 to +450 °C; above +450 °C on application. † SS 321 to order. Fittings & attachment can further limit ratings at temperature.

NOTES TO TABLE 1

1. Ratings apply to complete braided assemblies with welded end fittings at ambient temperature; assembly-specific ratings are confirmed per order on the test certificate.
2. Hose only (unbraided) is bulk hose for customer fabrication / low-pressure duty — limited by convolution squirm; never operate it at braided-assembly ratings.
3. Static radius = permanently formed installation. Flexing radius = repeated / dynamic movement — use the STATIC column for a fixed, one-time installation and the FLEXING column for any repeated movement. Flexing radii shown are Type 2 (continuous / high-cycle movement); Type 1 radii for occasional, low-cycle movement are smaller — ask EWPL engineering.
4. Pulsating / surge service: reduce working pressure by 50%. Values are EWPL published hose technical data. DN350 on request — confirm ratings with EWPL engineering.

09 / END CONNECTIONS & FLOW

# End connections & flow limits.

## END CONNECTION OPTIONS

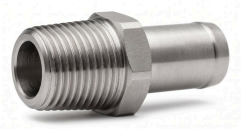
01



### Plain weld end

Bevel or socket weld for permanent pipe welding — process piping, industrial systems

02



### Threaded — NPT / BSP / metric

NPT (ASME B1.20.1) · BSP (ISO 228-1) · BSPT — general industrial, instrumentation

03



### Flanged — RF / FF / RTJ

EN 1092-1 (PN 6–40) · ASME B16.5 (Class 150 / 300 / 600) — high-integrity pipework, large bore

04



### Tri-clamp / sanitary

ISO 2852 · DIN 32676 · DIN 11851 · Tri-Clover type — pharma, food & beverage, CIP/SIP lines

05



### JIC 37° flare & ORFS

SAE J514 (JIC) · SAE J1453 (ORFS) — hydraulic and instrumentation interfaces

06



### Swaged / crimped end

Permanently attached fitting — high-pressure permanent installations

07



### Quick-release camlock

Type A–F single-hand connect / disconnect — tanker loading-unloading, mobile equipment

08



### Swivel flange

Rotating flange for positional adjustment where rotational misalignment must be absorbed

## FLOW VELOCITY LIMITS (M/S)

Exceeding these limits causes resonance-induced fatigue. If velocity is higher, upsize the bore or specify an interlock liner inside the hose.

| CONFIGURATION | GAS | LIQUID |
|---|---|---|
| Straight — unbraided hose | 30.5 | 15.2 |
| Straight — braided (1B / 2B) | 45 | 22 |
| 90° bend — unbraided hose | 15.2 | 7.6 |
| 90° bend — braided (1B / 2B) | 22.5 | 11 |

1B = SINGLE BRAIDED · 2B = DOUBLE BRAIDED. For intermediate bend angles, interpolate between straight and 90° values.

**GETTING THE LENGTH RIGHT**

Live length, movement and installation practice: Sections 10–11. Send your STAMPED enquiry (p.18) and EWPL will size the assembly.

10 / HOSE LENGTH & MOVEMENT

# Getting the length right.

Most metal-hose failures are installation-length failures. A hose that is too short over-bends at the fittings; one forced to absorb axial movement destroys its braid. These rules size the correct **live length (Lv)** — the flexible length between braid ferrules, excluding fittings.

1

### Movement in one plane only

A braided hose absorbs movement perpendicular to its axis. Never apply axial compression / extension or torsion — for axial movement use an expansion bellows, or install the hose in a loop.

2

### Lateral offset (both ends fixed)

Movement across the hose axis, T = total lateral travel; R = minimum bend radius (FLEXING column, p.08, for repeated movement; STATIC for one-time offset).

$$Lv = \sqrt{( 6 \cdot R \cdot T + T^2 )} \quad \cdot \quad Lp = \sqrt{( Lv^2 - T^2 )}$$

DN25 single-braid, repeated T = 25 mm · R (flexing) = 325 mm → Lv = √(6×325×25 + 25²) = √49,375 ≈ 222 mm → specify ≥ 225 mm live.

3

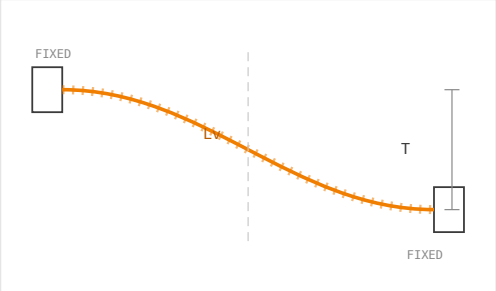
### 90° bend installation

Minimum live length for a 90° change of direction, plus straight tangents at each fitting:

$$Lv \geq 1.57 \times R$$

DN50 static 90° · R = 160 mm → Lv ≥ 252 mm → specify ≥ 255 mm. Flexing duty · R = 490 mm → Lv ≥ 770 mm.

LATERAL OFFSET — SCHEMATIC




4

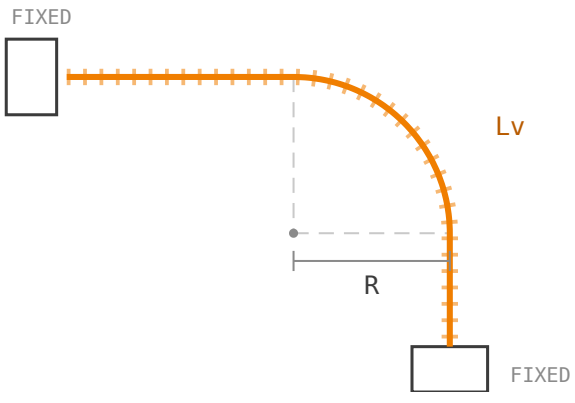
### Vibration duty

Install perpendicular to the main vibration direction, use the flexing-column radius, and keep the hose slack at operating position. Treat vibration amplitude as T. Clamp only rigid pipework — never the hose or braid.

5

### Keep fittings out of the bend

Provide a straight tangent of at least 2 × hose OD after each fitting before any bend begins. Never let the bend start at the braid ferrule.




90° BEND — SCHEMATIC · LV ≥ 1.57 × R

If in doubt, send us the movement, mounting orientation and available envelope with your **STAMPED enquiry (p.18)** — EWPL engineering will size the hose length for you.

11 / INSTALLATION & SERVICE LIFE

# Install it right. It will outlive the plant.

## HANDLING & STORAGE

- Store hoses straight or at large radius, capped, indoors and dry.
- Lift long / large-bore assemblies at two points — never drag over edges or lift by one fitting.
- Do not remove end caps until connection; keep $O_2$-clean assemblies sealed until use.

## INSTALLATION — CORRECT PRACTICE

- ✓ Check the assembly tag — WP, test pressure, media and date must match your service.
- ✓ Install movement in ONE plane, perpendicular to the hose axis (p.10).
- ✓ Use the FLEXING radius (p.08) for repeated movement; STATIC only for a one-time formed bend.
- ✓ Provide a straight tangent ≥ 2 × OD at each fitting before the bend starts.
- ✓ Never twist — align bolt holes without rotating the hose; specify a swivel flange where fit-up rotation is unavoidable.
- ✓ Support long horizontal runs; clamp on rigid fittings or adjacent pipe — never on the braid.
- ✓ Tighten threaded ends with two spanners so torque never passes through the hose.
- ✓ Protect against hot media and mechanical exposure — specify an interlock guard sleeve if required.

## SERVICE LIFE & INSPECTION

Metal hoses and bellows are fatigue-life products. Inspect in service for:

- Braid damage — broken wires, fraying, rust tracks, flattening
- Corrugation damage — dents, corrosion pitting, media build-up
- Leakage or "sweating" at fittings and welds
- Permanent deformation — kinks, squirm (bulging convolutions), banana set

Replace any assembly showing these signs — never repair braided hose in the field.

RECOMMENDED INSPECTION INTERVAL

**Annual**
Static duty

**6-monthly**
Flexing, pulsating or corrosive duty

WHEN A HOSE COMES UP FOR REPLACEMENT

Every EWPL assembly is tagged and its test record retained — and we run an **in-house laser marking machine**, so permanent laser-etched serial marking can be specified on any order. Quote the tag or serial — an identical certified replacement ships from the stock-size programme in **24–48 hours**.

— CORRECT / INCORRECT —

### BEND RADIUS

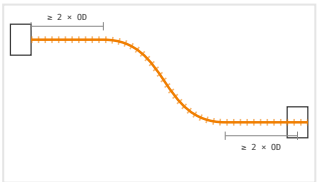


✓ Generous radius



✗ Kinked — radius too tight

### TANGENT AT THE FITTING

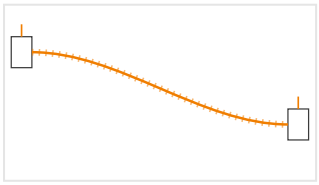



✓ Straight run ≥ 2 × OD

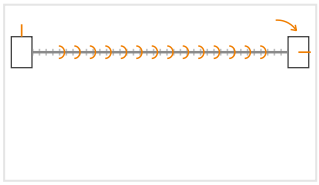


✗ Bend starts at the ferrule

### PLANE OF MOVEMENT



✓ One plane, no torsion



✗ Twisted about its axis

### LENGTH



✓ Relaxed slack loop



✗ Stretched taut to fit

02

PRODUCT FAMILY 02 · DN6 – DN200

# SS interlock flexible hoses

An interlock hose (also called *strip-wound hose*) is constructed from a continuous stainless steel strip wound in a helix and locked together with an interlocking profile — unlike a corrugated hose which is formed from tube. The interlocked seam is open, so interlock hoses are **not pressure-tight** and are used as flexible protective conduits, armoured sleeves, exhaust ducting, and flow liners.

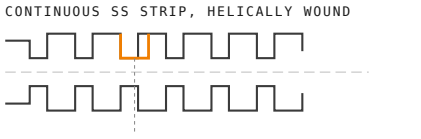



FIG. 02 — STRIP-WOUND INTERLOCK PROFILE · MAX TEMP 700 °C (SS304) / 800 °C (SS321)

PRIMARY APPLICATIONS

- PROTECTIVE SLEEVE / ARMOUR
- INNER LINER IN CORRUGATED BORE
- EXHAUST & VENTILATION DUCTING
- PNEUMATIC CONVEYING
- CABLE PROTECTION — HIGH-TEMP ZONES

## — CONSTRUCTION TYPES —

### Double interlock

Overlapping strip sections create a robust, flexible structure with good axial strength. Most common type — preferred for protective sleeving and general conduit.

### Loose interlock

Minimal strip engagement provides maximum bending flexibility. Used where the hose must conform to tight or irregular routing and axial load is low.

### Polygonal interlock

Specialised cross-section providing torsional rigidity without sacrificing lateral flexibility — resists twisting while still bending freely.

## — DIMENSIONAL SPECIFICATIONS · DN6 – DN200 —

| DN | BORE (MM) | OD (MM) | C/L BEND RAD. (MM) | MAX TEMP SS304 (°C) |
|---|---|---|---|---|
| DN6 | 6.0 | 8.0 | 38 | 700 |
| DN8 | 8.0 | 10.0 | 38 | 700 |
| DN10 | 10.0 | 12.5 | 50 | 700 |
| DN12 | 12.0 | 15.0 | 50 | 700 |
| DN16 | 16.0 | 19.0 | 50 | 700 |
| DN20 | 20.0 | 23.5 | 120 | 700 |
| DN25 | 25.0 | 28.5 | 135 | 700 |
| DN32 | 32.0 | 35.0 | 135 | 700 |
| DN40 | 40.0 | 43.5 | 165 | 700 |
| DN50 | 50.0 | 53.5 | 178 | 700 |
| DN65 | 65.0 | 68.0 | 245 | 700 |
| DN80 | 80.0 | 83.0 | 280 | 700 |
| DN100 | 100.0 | 105.0 | 555 | 700 |
| DN125 | 125.0 | 130.0 | 590 | 700 |
| DN150 | 150.0 | 155.0 | 655 | 700 |
| DN200 | 200.0 | 207.0 | 1050 | 700 |

DOUBLE INTERLOCK, STANDARD SS304 · SS316L & SS321 TO ORDER · PROTECTIVE CONDUIT, NOT PRESSURE-RATED · PACKED INTERLOCK ≈ 2× RADIUS · SIZES ABOVE DN200 ON DEMAND — CONTACT ENGINEERING

# 03

PRODUCT FAMILY 03 · DN50 – DN3000

# SS bellows & expansion joints

A metal bellows expansion joint is a pressure-containing element incorporating one or more thin-wall corrugated bellows sections fabricated from stainless steel or special alloy. Installed in a pipeline, it absorbs thermal expansion and contraction, vibration, misalignment, and structural settlement — relieving connected equipment and pipe supports of potentially damaging forces and moments.

Unlike corrugated hoses, bellows and expansion joints are **engineered-to-order products** — each one calculated to the specific DN, pressure, temperature, and movement requirement of the installation, per EJMA and EN 14917:2021, with documented fatigue life, squirm stability analysis, and spring rate supplied with every order.

| SIZE RANGE | DESIGN STANDARD | CONVOLUTION |
|---|---|---|
| DN50–DN3000 | EJMA / EN 14917 | SINGLE / MULTI-PLY |

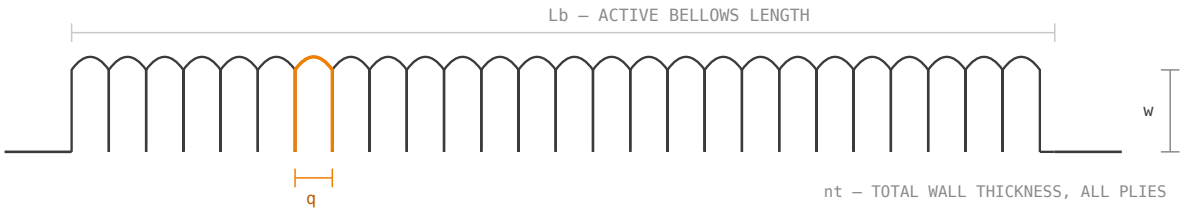



FIG. 03 — BELLOWS CONVOLUTION PROFILE

W HEIGHT · Q PITCH · LB ACTIVE LENGTH · NT TOTAL WALL THICKNESS

## — CORE TECHNICAL SPECIFICATIONS —

| | |
|---|---|
| **Nominal diameter range** | DN50 to DN3000 |
| **End fitting materials** | Carbon steel, SS 304 / 316, precision-cast, forged alloy fittings |
| **Connection types** | Plain weld ends (ISO bevel) · EN 1092-1 flanges · ASME B16.5 flanges · RTJ |
| **Design pressure** | Full vacuum to 50 barg standard — higher pressures with engineering review |
| **Temperature range** | -196 °C to +900 °C (material-dependent) |
| **Convolution construction** | Single-ply or multi-ply laminated — superior fatigue and pressure performance |
| **Design standards** | EJMA (11th Ed.) · EN 14917:2021 |

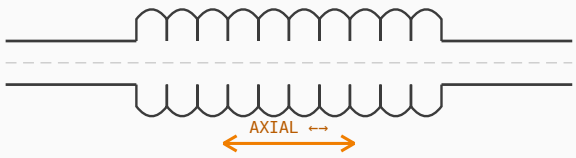
14 / BELLOWS ASSEMBLY CONFIGURATIONS

# Assembly configurations.

SELECT BY DIRECTION + MAGNITUDE
OF MOVEMENT TO BE ABSORBED

## Single bellows — axial

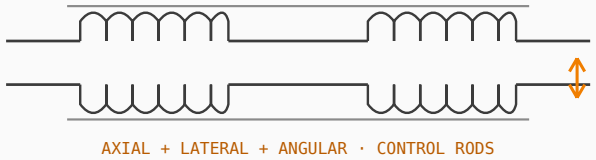
CFG. A




| | |
|---|---|
| MOVEMENT | Axial compression / extension |
| THRUST | Not contained — anchors carry thrust |
| USE | Single-axis thermal expansion, anchored piping |

## Universal — dual bellows, lateral

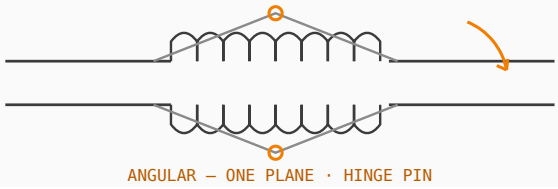
CFG. B




| | |
|---|---|
| MOVEMENT | Axial + lateral + angular |
| THRUST | Not contained — anchors required (tied variant: rods carry thrust) |
| USE | General purpose complex pipe movements |

## Hinged — single plane angular

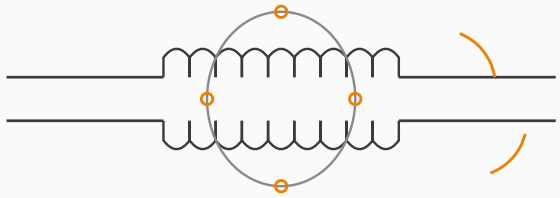
CFG. C




| | |
|---|---|
| MOVEMENT | Angular in one plane only |
| THRUST | Contained — via hinge apparatus |
| USE | In pairs / triples for large lateral offset |

## Gimbal — multi-plane angular

CFG. D

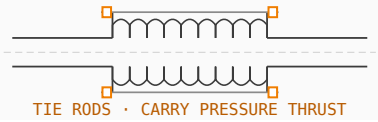


| | |
|---|---|
| MOVEMENT | Angular in any plane |
| THRUST | Contained — via dual gimbal ring |
| USE | Omni-directional rotation at pipe bends |

— RESTRAINED & PRESSURE-BALANCED —

## Restrained — tie rods

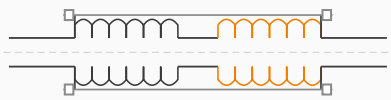
CFG. E




Lateral · rods carry full thrust

## Pressure-balanced (inline)

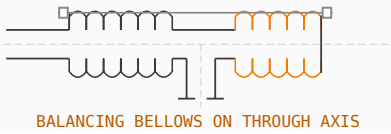
CFG. F




Axial + lateral · no main anchors

## Pressure-balanced (elbow)

CFG. G




Axial + lateral at direction change

### INTERNAL LINER (FLOW SLEEVE)

Fitted inside the bellows for high-velocity, turbulent or abrasive media — prevents impingement on the corrugated surface, extends fatigue life, smooths flow. Specify when gas or steam exceeds 1.2 m/s per 25 mm of bore up to DN150 (7.6 m/s above), liquid exceeds 0.6 m/s per 25 mm (3 m/s above), media is abrasive / particulate / slurry, flow is turbulent at direction changes, or for high-temperature steam and gas injection. Bellows only — corrugated-hose velocity limits are on p.09.

15 / MATERIAL REFERENCE

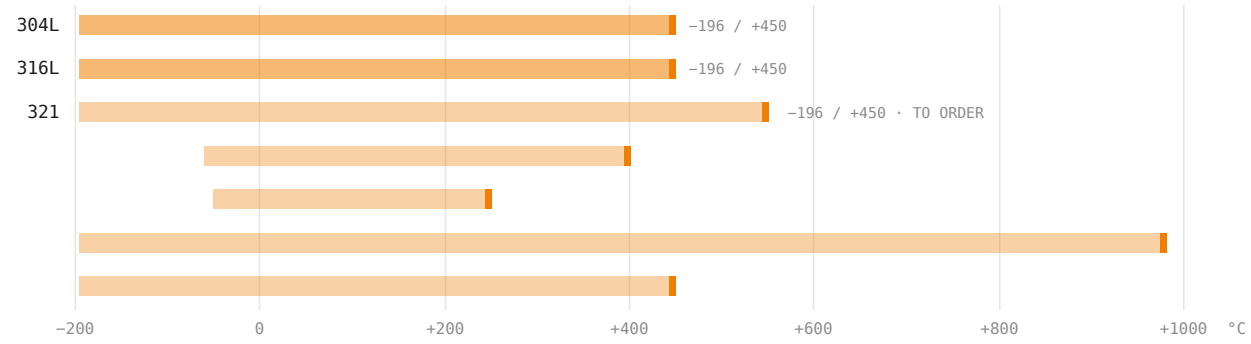
# Stainless grades & their limits.

■ = HELD IN STOCK
ALL OTHER GRADES TO ORDER

| GRADE | DIN / EN | COMPOSITION | TEMP. RANGE | PRIMARY APPLICATIONS |
|---|---|---|---|---|
| ■ AISI 304L | 1.4307 | Fe + 18–19% Cr, 8–10% Ni, low C | -196 / +450 °C | General industrial, cryogenic, excellent weldability |
| ■ AISI 316L | 1.4404 | Fe + 17–18% Cr, 10–13% Ni, 2–2.5% Mo, low C | -196 / +450 °C | Chemical, marine, aggressive media — Mo for pitting resistance |
| AISI 321 | 1.4541 | Fe + 18–19% Cr, 9–12% Ni, Ti stabilised | -196 / +450 °C · higher on application | High temperature, steam, thermal cycling above 400 °C |

TEMPERATURES ABOVE ARE FOR PRESSURE-RETAINING SERVICE — UNPRESSURISED INTERLOCK CONDUIT AND PROTECTIVE SLEEVING RATE HIGHER, SEE P.12.

— GRADE SELECTION BY APPLICATION TEMPERATURE —




**Stocked grades cover −196 °C to +450 °C.**
**Above +450 °C, SS 321 on application.**

304L · 316L IN STOCK — SS 321 TO ORDER · CONTACT ENGINEERING FOR SPECIAL SERVICE

16 / MEDIA COMPATIBILITY GUIDE

# Media quick guide.

Indicative compatibility of stocked grades with common industrial media at ambient temperature.

A Suitable  C Conditional — concentration / temperature dependent; consult EWPL

X Not recommended — use PTFE-lined hose or special alloy

| MEDIA | SS 304L | SS 316L | NOTES |
|---|---|---|---|
| Water — fresh, DM, condensate | A | A | |
| Steam (saturated / superheated) | A | A | Apply derating table, p.08 |
| Seawater / brine / chlorides | X | C | Pitting risk — PTFE-lined or a special alloy preferred |
| Nitrogen · argon · helium | A | A | |
| Compressed air | A | A | |
| Natural gas / CNG | A | A | |
| LPG | A | A | |
| Hydrogen | C | C | 316L preferred — hydrogen service assessed case by case; consult EWPL engineering |
| Oxygen | C | C | $O_2$-clean preparation mandatory; velocity limits apply |
| Ammonia (anhydrous) | A | A | |
| $CO_2$ (dry) | A | A | Wet $CO_2$ (carbonic acid) → C |
| Diesel · fuel oils · lube oil | A | A | |
| Ethanol · methanol | A | A | |
| Acetone · ketones | A | A | |
| Toluene · xylene · aromatics | A | A | |
| Caustic soda (NaOH, dilute, ambient) | A | A | Hot / concentrated → C |
| Nitric acid (dilute) | A | A | Fuming / hot → C |
| Phosphoric acid | C | C | Dilute-cold 316L acceptable; hot → PTFE-lined or special alloy |
| Sulphuric acid | X | C | Only very dilute, cold; otherwise PTFE-lined or special alloy |
| Hydrochloric acid | X | X | PTFE-lined hose only |
| Chlorine — dry gas | C | C | Wet chlorine → X (PTFE-lined) |
| Milk · dairy · beverage | A | A | Sanitary tri-clamp, crevice-free welds |
| Vegetable oils · syrups | A | A | |

**IMPORTANT**

Indicative only, at ambient temperature — corrosion depends on concentration, temperature, aeration, velocity and contamination. Final selection is confirmed by EWPL engineering against your STAMPED sheet (p.18); for aggressive or mixed media specify PTFE-lined hose or a special alloy (p.15).

17 / STAMPED SELECTION FRAMEWORK

# Specify with STAMPED.

COMPLETE ALL 7 BEFORE REQUESTING
A QUOTATION — MORE DATA, FASTER RFQ

| | | |
|---|---|---|
| **S** | **Size** | Identify the required inner diameter (ID) precisely in DN or mm. Standard sizes: DN6–DN350 corrugated, DN6–DN200 interlock, DN50–DN3000 bellows. Oversizing reduces pressure ratings; undersizing increases flow velocity and pressure drop. |
| **T** | **Temperature** | State both the operating temperature of the media and the ambient external temperature. For steam or hot-oil service, specify maximum temperature including start-up peaks. For cryogenic service, specify minimum temperature and whether the hose will experience thermal cycling. |
| **A** | **Application** | Describe the installation: is the hose stationary or in motion? Specify direction of movement (axial, lateral, angular) and whether movement is static, intermittent, or continuous vibration. State spatial constraints and required free length. |
| **M** | **Media** | Identify every fluid or gas that will contact the hose bore — including cleaning agents and purge media. Also identify the external environment (condensation, chemical splash, UV, abrasion). Incompatible material–media combinations cause premature failure. |
| **P** | **Pressure** | State (a) normal working pressure, (b) maximum surge pressure, and (c) whether the system experiences pulsating pressure (cyclic variation). For pulsating service, working pressure must be reduced by 50% to account for fatigue. |
| **E** | **End connections** | Specify the required connection type at each end: thread standard (NPT / BSP / metric), flange standard (ASME B16.5 / EN 1092-1), bore size, and pressure class. Include whether rotation or swivel function is required. |
| **D** | **Delivery / flow rate** | State the volumetric flow rate or fluid velocity. For corrugated hoses, excessive velocity causes resonance and fatigue failure. Maximum recommended: gas 45 m/s, liquid 22 m/s (braided hose, straight run) — see Section 09 for bend and unbraided limits. |

S · T · A · M · P · E · D — send the completed checklist to info@essemworks.com for a rapid, accurate quotation.

18 / ENQUIRY DATA SHEET

# Enquiry data sheet.

FILL WHAT YOU KNOW — INCOMPLETE IS FINE
ONE SHEET PER ASSEMBLY TYPE

Scan or photocopy this page, complete it, and send to **info@essemworks.com** or WhatsApp **+91 90815 68688** / **+91 99259 57579**. EWPL engineering will follow up on any gaps.

## ENQUIRY / PROJECT

Company ..... Contact ..... Phone / e-mail .....
Project / PO ref ..... Quantity ..... Required delivery .....

## S SIZE

Nominal bore (DN or mm) ..... Face-to-face length (mm) .....
Space / envelope restrictions .....

## T TEMPERATURE

Media temp — normal ..... °C max ..... °C min ..... °C
Ambient ..... °C Thermal cycling? ☐ Y ☐ N — cycles/day .....

## A APPLICATION

☐ Static ☐ Vibration ☐ Intermittent flex ☐ Continuous flex
Movement ☐ Axial* ☐ Lateral ☐ Angular Travel ± ..... mm / °
☐ Horizontal ☐ Vertical Mounting sketch attached? ☐ Y ☐ N
*axial movement → expansion bellows, not hose

## M MEDIA

Media conveyed (incl. cleaning / purge) .....
Concentration ..... ☐ Liquid ☐ Gas ☐ Steam ☐ Slurry
External: ☐ Weather ☐ Chem splash ☐ Abrasion ☐ Washdown

## P PRESSURE

Working ..... bar Surge / peak ..... bar
☐ Pulsating
Vacuum? ☐ Y ☐ N ..... mbar(a) Test pressure ..... bar

## E END CONNECTIONS

End 1 — type ..... std ..... size ..... class .....
End 2 — type ..... std ..... size ..... class .....
☐ Swivel / rotation ☐ $O_2$-clean ☐ ATEX zone .....

## D DELIVERY / FLOW

Flow rate ..... ($m^3/h$ or kg/h)
or velocity ..... m/s

## QA MATERIAL & QA

☐ 304L ☐ 316L ☐ 321 ☐ Other ..... Fittings .....
☐ EN 10204 3.1 ☐ TPI witness ☐ Helium leak test ☐ Spring-rate report
☐ Laser-etched serial marking

## FOR BELLOWS / EXPANSION JOINTS ONLY

Design code ☐ EJMA ☐ EN 14917 ☐ ASME Design life ..... cycles Spring-rate limit ..... N/mm
Movement — axial ± ..... mm lateral ± ..... mm angular ± ..... ° ☐ Internal liner ☐ External cover
Installation ☐ Between anchors ☐ At equipment nozzle ☐ Elbow / direction change

19 / INSIDE THE WORKS

# One roof, one controlled flow.

Our 32,000 sq.ft. manufacturing facility at Moraiya, Ahmedabad integrates hydroforming, mechanical forming, automated braiding, TIG welding, leak testing, and dispatch under one roof — every product moves through a controlled, traceable production flow.

1. **Incoming material**
   Mill test certificates verified against specification · heat-number traceability begins.
2. **Forming**
   Hydroforming DN20–DN300 · mechanical forming DN6–DN50 · dimensional checks at every setup, first-piece inspection.
3. **Braiding**
   Single or double SS wire braid applied over the corrugated core on automated braiding machines.
4. **Welding**
   TIG welding of end fittings · weld visual inspection and dimensional verification at each station.
5. **Leak test**
   100% pneumatic leak test on every assembly · hydrostatic at 1.5× working pressure, burst and fatigue tests to customer requirement.
6. **Dispatch**
   Full documentation pack — test records, certificates of conformity, packing list — marked, packed and dispatched.

FACILITY

**32,000** sq.ft.
Built-up factory area

**5** bays
Forming · braid · weld · test · dispatch

**100%** tested
Pneumatic leak test on every assembly

**3** ISO certs
9001 · 14001 · 45001 — TÜV Rheinland

20 / THE SHOP FLOOR

# The shop floor.

Photographed on the production floor at Moraiya, Ahmedabad — forming, braiding, welding, testing and stores, in the sequence of p.19.



01 TIG welding of end fittings — assembly benches



02 SS wire braid applied over the corrugated core



03 Corrugation line — forming control



04 Large-bore braided assembly — final inspection



05 Test bench — 100% of assemblies leak-tested



06 Caged material stores — heat-number traceability



07 Annealed corrugated hose awaiting braid

21 / THE PRODUCT RANGE

# The product range.

Photographed at Essem Works, Moraiya, Ahmedabad — every assembly shown is a production item, built and tested in-house.



01 Bellows elements — DN50 to DN3000, single & multi-ply



02 Flanged braided assembly — equipment nozzle



03 Tied expansion joint — rods contain thrust



04 SS braided assembly — flanged, sanitary top connection



05 SS interlock strip-wound hose



06 Camlock quick-release coupling



07 SS304 wire braid over the corrugated core

22 / THE PRODUCT RANGE

# Built to order.

Sizes from DN6 to DN3000, and end connections to suit the line — flanged, threaded, sanitary, quick-release or welded.



08 Braided assemblies — graduated bore, JIC and union ends



09 Braided assembly with 90° elbow end fitting



10 Bellows element — convolution form and tangent



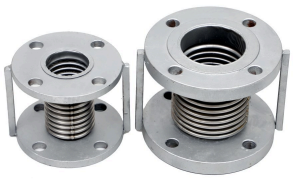
11 Engineered bellows assembly — branch connections



12 Swaged ferrule and union-nut termination



13 Bellows unit on square mounting base



14 Flanged expansion joints — matched pair

23 / QA, TESTING & HOW TO ORDER

# QA, testing & how to order.

## QUALITY ASSURANCE REGIME

Quality management system certified to ISO 9001:2015 by TÜV Rheinland — certified scope: stainless steel annular corrugated metallic hose, braid, hose assemblies and related end fittings. Environmental and occupational-health systems are certified to ISO 14001:2015 and ISO 45001:2018 across the full product range. Every product is traceable from raw material mill certificate through to final test record and dispatch documentation.

### Incoming material verification

Mill certificates verified against spec · dimensional inspection — wall, diameter, surface · heat-number traceability

### In-process monitoring

Dimensional checks at each forming & assembly stage · weld visual + dimensional verification · first-piece inspection on every new setup

### Final testing — 100% of assemblies

Pneumatic leak test on every assembly · hydrostatic at 1.5 × working pressure to customer requirement

### Type testing — new designs

Burst test · fatigue cycle test

## AVAILABLE ON REQUEST

- ☐ Helium mass spectrometry leak test
- ☐ Radiographic / ultrasonic / dye penetrant examination
- ☐ Axial spring rate measurement
- ☐ Third-party witness inspection

## HOW TO ORDER

1 **Specify**

Complete the STAMPED checklist (p.17) and state:

- PRODUCT TYPE
- NOMINAL SIZE (DN)
- ASSEMBLY LENGTH
- QUANTITY
- WORKING PRESSURE
- DESIGN TEMPERATURE
- CONVEYED MEDIA
- END CONNECTION — END 1
- END CONNECTION — END 2
- MOVEMENT REQUIREMENTS
- MATERIAL PREFERENCE
- SPECIAL REQS — ATEX, $O_2$-CLEAN, TPI

2 **Send**

Email **info@essemworks.com**, or WhatsApp / call **+91 90815 68688** or **+91 99259 57579**.

3 **Review**

EWPL engineering confirms the design — bellows calculated per EJMA / EN 14917 — and returns a quotation.

4 **Order**

Stock sizes: 24–48 hours. Made-to-order assemblies: 2–3 weeks ex-works. Engineered bellows: 4–8 weeks subject to design review and material lead time.

**SCAN FOR QUOTE**

wa.me/919081568688 — WhatsApp chat
RFQ — info@essemworks.com
+91 90815 68688 · WhatsApp / call
+91 99259 57579 · WhatsApp / call
essemworks.com

24 / GLOSSARY & UNITS

# Speak flexible.

## GLOSSARY

**Live length (Lv)** — the flexible corrugated length between braid ferrules; the only part of the assembly that bends.

**Test pressure** — 1.5 × WP; applied to customer requirement. Every assembly is pneumatically leak-tested before dispatch.

**Squirm** — buckling instability of a hose or bellows under internal pressure; governs unbraided hose ratings.

**Flexing (dynamic) bend radius** — the tightest radius for repeated movement; typically 2–6 × the static radius.

**Pressure thrust** — the axial force (pressure × effective area) an unrestrained bellows exerts on the piping; determines anchor design.

**Agraff / interlock profile** — the folded, hooked strip seam of a strip-wound hose.

**CIP / SIP** — clean-in-place / sterilise-in-place (sanitary services).

**Lp** — the installed straight-line distance between fitting ends of an offset installation; Lp = √(Lv² − T²).

**Working pressure (WP / MAWP)** — maximum pressure at ambient temperature, continuous duty, with a 4:1 margin on burst.

**Burst pressure** — pressure at which a new design fails in destructive type testing; ≥ 4 × WP.

**Static bend radius** — the tightest radius for a permanently formed, one-time bend.

**Spring rate** — force per unit movement of a bellows (N/mm); supplied with every engineered bellows.

**Convolution / pitch / ply** — one corrugation wave; the spacing between waves; one wall layer of the bellows.

**Packed interlock** — interlock hose with packing in the seam for semi-sealed, low-pressure duty.

**EN 10204 3.1** — inspection certificate type — mill-traceable material certification.

**T** — total lateral travel across the hose axis; the movement the offset must absorb.

## UNIT CONVERSIONS

`1 bar = 1.0197 kg/cm² = 14.50 psi = 100 kPa = 0.1 MPa`

`°F = (°C × 1.8) + 32  ·  1 inch = 25.4 mm`

`1 kg/cm² = 0.9807 bar = 14.22 psi`

`DN = nominal bore in mm (DN25 ≈ 1") — size column, p.08`

GET IN TOUCH · RFQ / STAMPED SPEC / DRAWINGS

# Build with the right lifeline.

From a 6 mm instrument line to a DN3000 bellows — every EWPL assembly is engineered, pneumatically leak-tested and marked before dispatch. Send us your STAMPED specification or scan the QR for a quote.


### WORKS & REGISTERED OFFICE

Plot No. 72/F, Sopan Kesar Industrial Hub,
Moraiya, Sanand, Ahmedabad – 382 213,
Gujarat, India

### SALES OFFICE

505 Maruti Ridge, Iscon Cross Road,
S.G. Highway, Ahmedabad – 380 058,
Gujarat, India

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ISO 9001:2015 · ISO 14001:2015 · ISO 45001:2018 – TÜV RHEINLAND

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