

Applications

ISOBRUGG steel-cased piping is suitable for use with all the media, temperatures, piping dimensions and pressure stages standard in distant heating and cooling depending on the piping materials and sidewall thickness. In addition, it is also used in industry as product piping.

Standard applications
up to +200C

- warm water
- hot water
- domestic hot water
- thermal oil
- condensate

High temperatures
up to +600C

- steam
- hot air and gases

Low temperatures
to -30C

- chemical products (safety piping)
- cooling water, refrigeration


Isobrugg steel-cased piping is excellent for

- difficult ground conditions
- wet ground
- subsidence-endangered areas
- stream crossings (drains)
- road crossings
- for roadwork's and under concrete surfaces
- transport piping

Special uses of steel-cased chambered piping are: laying where this is subject to WHG § 9 and as safety piping in accordance with TRbF and VbF.

Steel-cased piping dimensions and design data

Carrier pipe	DIN 25 to DN 1200
Temperatures	up to 500 C
Special tailored types	up to 600 C
Pressure stages	up to PN 64

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System Description		

Steel-cased piping has been field-proven over decades as a “steel-in-steel” piping system for laying direct in the ground, suitable for transporting distant heat, steam, condensate and other media.

Both the straight special units up to 16 metres in length and all the system-typical components such as bends, junctions, anchors, supports, etc. are pre-fabricated ex works. This means greater safety by comparison with on-site assembly.

Steel-cased piping is suitable for all the application areas and operating conditions met in practise, but especially for extremely high temperatures and pressures. Strictly project-related pre-fabrication ensures the economic relationship of production costs to operating needs. The choice of carrier piping specification, determination of insulation thickness and calculation of the casing nominal dimensions is always dependent on the specific operating conditions.

The gas- and water-tight welding of the carrier piping to the casing piping in shaft and construction bushings is standard in **steel-cased piping**. It is the pre-condition for the evacuation of the space between the carrier and casing piping. This evacuation ensures removal of any residual damp. At the same time, the insulation of the piping is greatly improved.

Vacuum maintenance and monitoring ensures excellent means of checking that the system does not leak. This ensures safety during the operation of the system.


Further safety measures are the carefully project-related cathodic corrosion-proofing preventing external corrosion of the casing piping. In addition, electronic monitoring devices warn immediately of any damp entering the insulation.

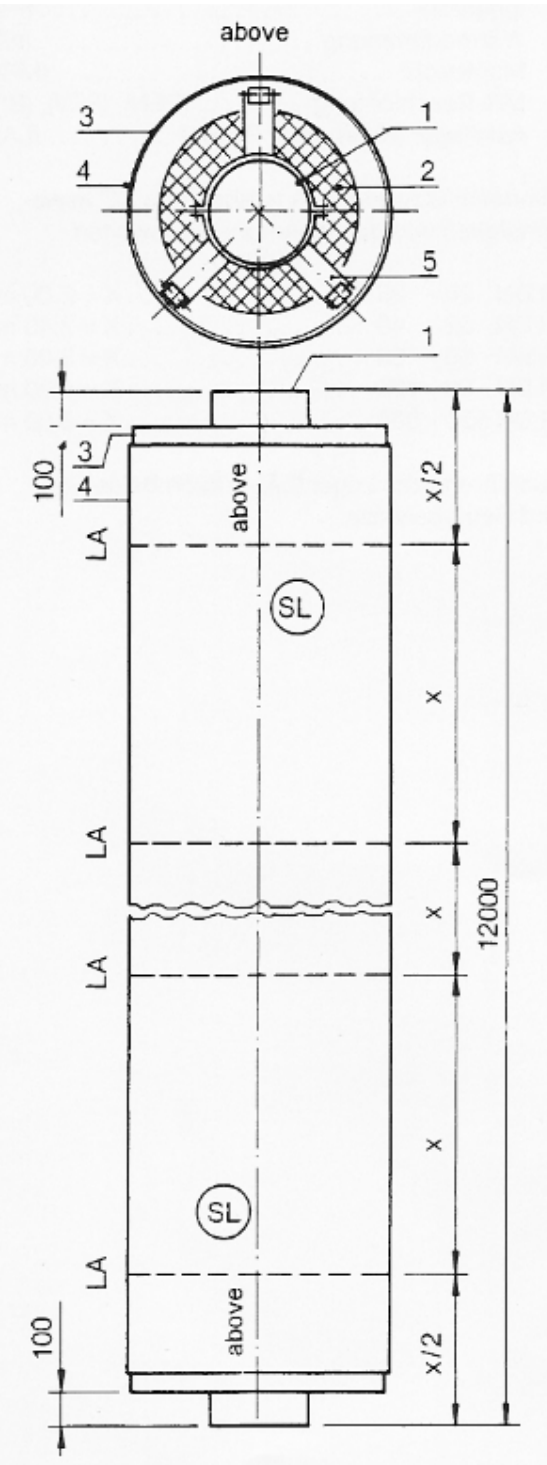
The robust tailored design on the basis of long experience in building and using this piping system makes **steel-cased piping** a top-quality, safe transport means for all temperatures.



Prefabricated SCP-Steel Cased Pipe		Page
Technical Specification		4

<p>Material-specific standard components</p> <p>Casing piping Longitudinally or spirally welded steel piping, dimensions according to DIN 2458, ISO, Material St. 37.0 or St. 52.0 (WA or WB) Delivery conditions DIN 1626 (dated October 84) Seal of approval DIN 50049-2-2 or 3.1B Welding bevelling per DIN 2559, Page 1, Code Number 21 or 22</p> <p>Exterior protection a) Bituminous sheathing for increased temperatures per DIN 30673, Type A 5.5 G, double-wrapped with carrier layer of glass fibre cloth. b) PE-coated per DIN 30670 N, type n or v, electrical puncture strength 20 kV, peel resistance 35 N.</p> <p>Carrier piping a) Seamless steel piping per DIN 2448, ISO, Material St. 37.0 or St. 52.0 S, DIN 1629/EN 10216 with welding bevelling per DIN 2559 Page 1 Code No. 21 or 22. Material approval per DIN 50049-3.1B including circular seams in ex works special units. b) Seamless piping of heat-resistant steel (boiler piping) per DIN 17175 St. 35.8, Materials approvals per DIN 50049-3.1 B, welding bevelling per DIN 2559, Page 1, Code No. 21 or 22. c) Welded piping, longitudinal or spiral weld, dimensions per DIN 2458/EN 10217, ISO, delivery conditions per DIN 1626, St. 37.0 (WA or WB), Material approval per DIN 50049-3.1.B, welding bevelling per DIN 2559, Page 1, Code No. 21 or 22.</p> <p>Heat insulation Make-up pieces of high-silicate mineral wool fibre, SiO₂ content about 60% or make-up pieces of rock wool fibre, water resistant, temperature resistant 300 °C, thermal conductivity 0.035 W/(m x K) (20C), non-flammable per DIN 4102/A1.</p> <p>Insulating make-up pieces fastened to carrier piping with stainless steel bands.</p> <p>Guide and friction supports Guide supports are roller- or friction-bearing supports. Rollers made of material GG 24 or St. 37-2k, roller bolts of St. 37-2k or stainless steel 1.4301, screws of heat-resistant material. Depending on operating temperature, dollies for reducing thermal transfer made of suitable VA materials. To stop the heat flow, the support make-up pieces are secured to the medium-carrying piping with compressed fibre strips.</p> <p>Bends a) Carrier piping bends Analogous to DIN 2605 or 2606 Material per carrier piping specs. Welding seams non-destructively tested to DIN 5411 using X-rays or gamma-rays. b) Casing piping bends Made in segments, radius per carrier piping. Material per piping specs. Weld seams non-destructively tested per DIN 54111. Tested for 100% leak-proofing. In the segment welding seam areas, insulation protection with fire-resistant material to prevent burning during welding.</p> <p>Anchor a) Free of thermal bridging, for taking up carrier piping reaction forces or bellows expansion joint reaction forces. Installed in special units ex works. consists of 2 steel rings, US-tested, reinforced with plating and welded to carrier piping. A US-tested reinforced steel ring as casing piping disc welded to casing piping. KV3 wedges (asbestos-free) installed as force-transmitting intermediate support to interrupt heat flow and for electrical insulation. The specific anchor design ensures each component is subjected only to pressure stress. b) Intermediate anchor consisting of a plate on the casing piping, two plates on the carrier piping and pressure-fast intermediate supports isolating heat flow.</p>		
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Prefabricated SCP-Steel Cased Pipe	
Technical Specification	
<p>End caps</p> <p>Vacuum-tight end caps between carrier and casing piping with simultaneous taking up of the axial movement of the carrier piping.</p> <p>a) Bellows-type termination</p> <p style="padding-left: 20px;">Expansion joint of material 1.4541, single- or multi-walled. Expansion take-up max. 30 mm, PN 16. Reduction of carrier piping temp. via bellows length.</p> <p>b) MS bellow termination</p> <p style="padding-left: 20px;">Expansion joint of material St. 37 Expansion take-up max. 6 mm Pre-fab installation ex works in special units with vacuum and evacuation connections.</p> <p>Wall bushing</p> <p>Wall bushing consisting of sleeving piping with collar, prodoral coated, steel cased piping guided in collaring with friction slides, annular area sealed with rubber gasket. Electrically insulated.</p> <p>Connection between casing piping and sleeve MS bellow or heat-shrunk hosing. Complete special unit ex works. If necessary, annular space filled with suitable bituminous mass.</p> <p>T-branch</p> <p>Pre-fab and installed in a special unit ex works. Steel cased piping junctions - welding saddle per DIN 2618 Medium-carrying ping junction - T-piece per DIN 2615 or Weldolet.</p> <p>Plant monitoring</p> <p>Specially developed automated warning and location metrology and monitoring system to permanently monitor dampness in the entire STEEL-CASED PIPING network using the resistance measurement method.</p> <p>Evacuation</p> <p>Evacuation of the casing piping after completion and commissioning using a mobile vacuum motor to remove all damp from the insulation and the casing piping.</p> <p>Services available</p> <p>Planning and engineering</p> <p>a) Pipeline design plans b) Detail plans c) Piping construction engineering calculations d) Metrology documentation, system monitoring/cathodic corrosion protection e) Evacuation documentation f) Pressure increase testing documentation / on demand</p>	



Steel-cased piping standard lengths (SL) with single-pipe design (SINGLE-PIPE CONDUIT)

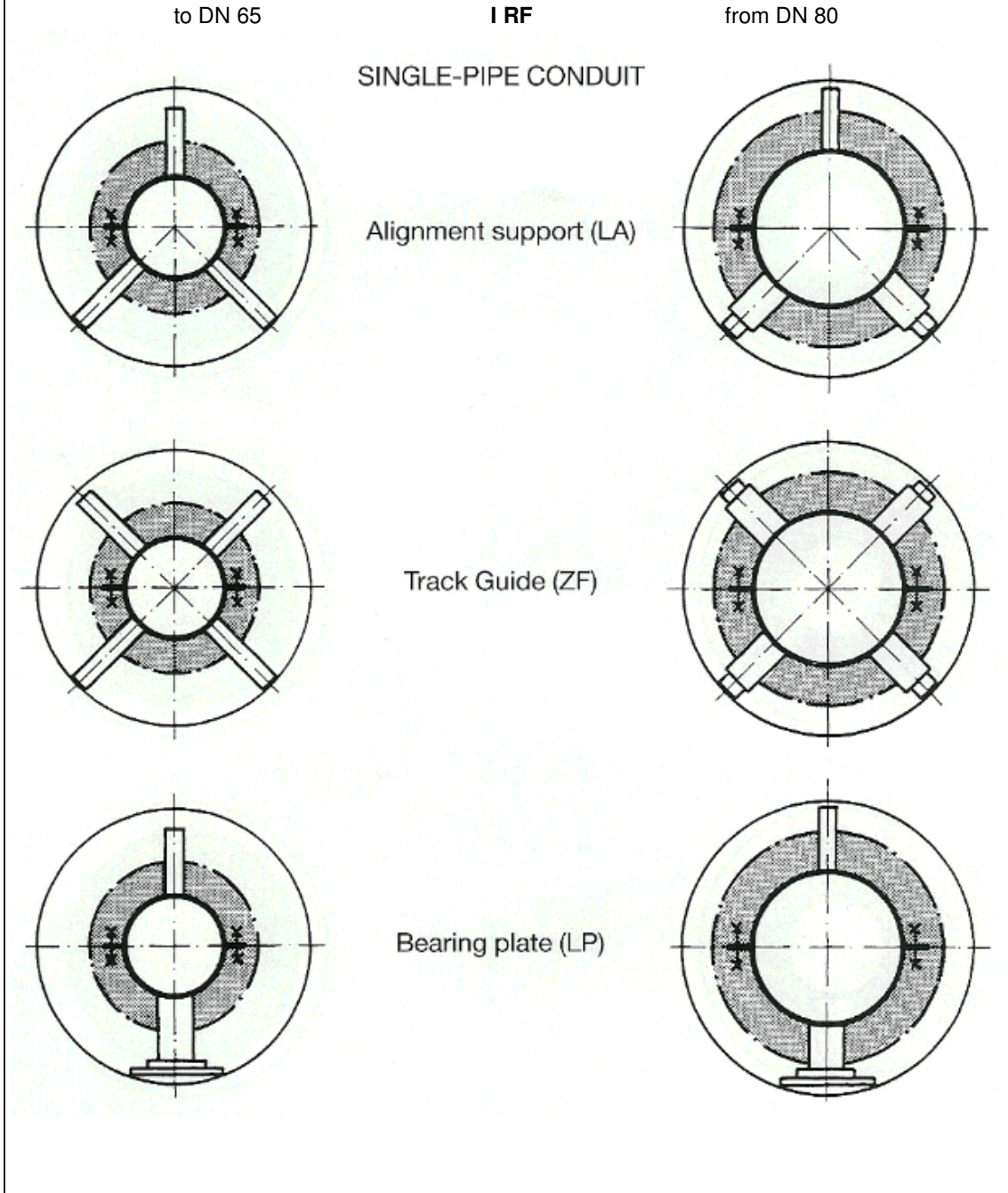
- 1 Carrier piping (CARRIER PIPING)
- 2 Thermal insulation (IS)
- 3 Casing piping (CASING PIPING)
- 4 CASING PIPING coating (PEN), (PEV), (BI)
- 5 Alignment support (slide or roller) LA

Min. span, support intervals "X" dependent on nominal carrier piping dimensions

- CARRIER PIPING DN 20 - 25 X = 2.00 m
- CARRIER PIPING DN 32 - 40 X = 2.40 m
- CARRIER PIPING DN 50 - 65 X = 3.00 m
- CARRIER PIPING DN 80 - 125 X = 4.00 m
- CARRIER PIPING DN 150 - 500 X = 6.00 m

Support (alignment support) design dependent on load and operating mode.

The bearings are due to a functional guidance and support of the thermal isolated carrier pipe inside the casing pipe.



Interim anchor (ZFP) in SINGLE-PIPE CONDUIT

An interim anchor is a connecting piece between the carrier and casing piping. It has the purpose of taking up the carrier piping reaction forces and diverting them to the casing piping and, from there, to the ground.

The anchors are installed in the special units ex works.

The Isobruugg steel-cased piping anchors are so designed that the overall design prevents unacceptably high carrier and casing piping temperatures.

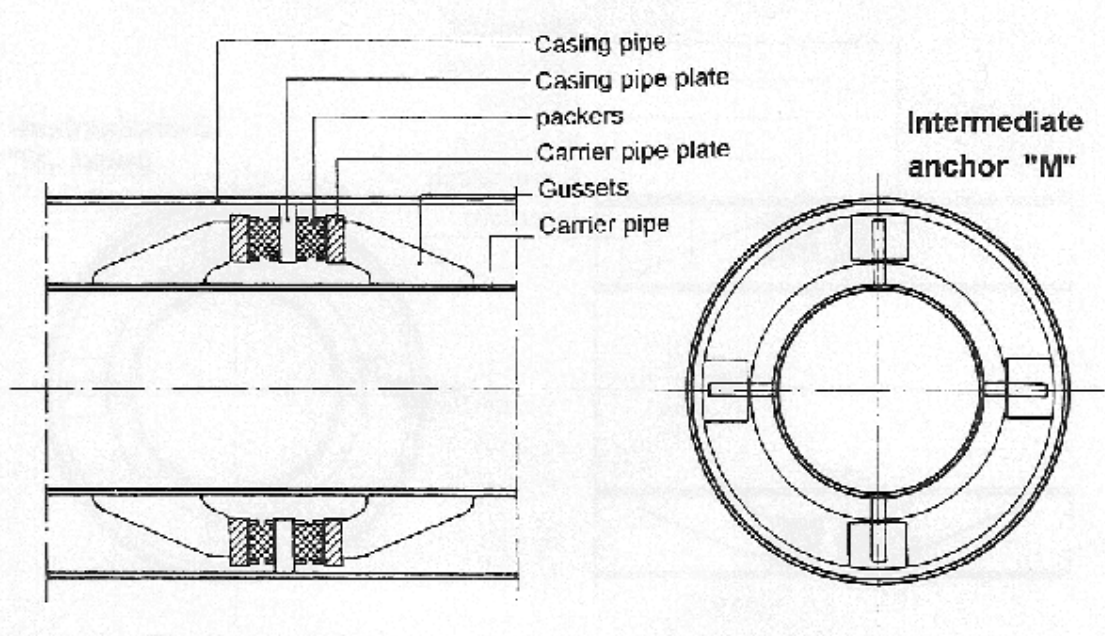
Calculation of carrier piping reaction forces effects and the design and dimensioning of anchors is project-related and dependant on the specific Isobruugg steel-cased piping.

Interim anchor “CASING PIPING” in single-pipe conduits

An anchor with torsion-resistant securing device/s is installed when compensators and cold or thermal prestressing are used.

Diagram of an interim anchor

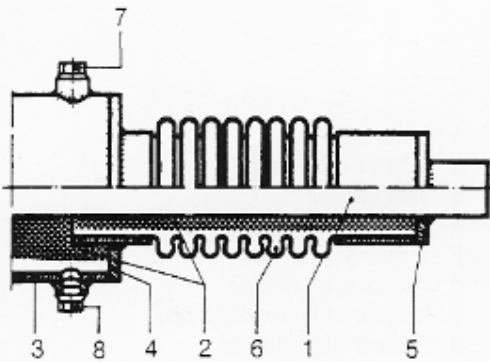
Principle sketch of interim anchor



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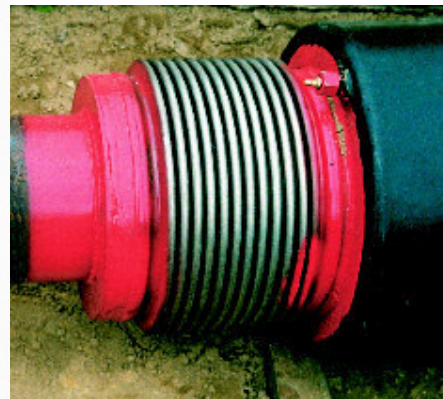
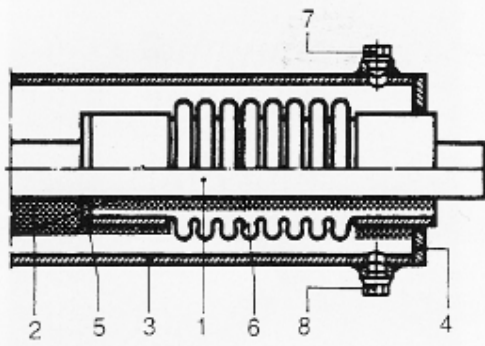
Bellows-type terminations are gas- and vacuum-tight caps permitting axial movement of the carrier piping.
Bellows-type terminations are pre-fabricated ex works and installed in special units.

Axialexpansionbellow
external



- 1 Carrier pipe
- 2 Thermal insulation
- 3 Casing pipe
- 4 Casing pipe plate
- 5 Carrier pipe plate
- 6 Axialbellow
- 7 Vacuumconnection
- 8 Drainplug

Axialexpansionbellow
internal



Wall bushings (MD) for single

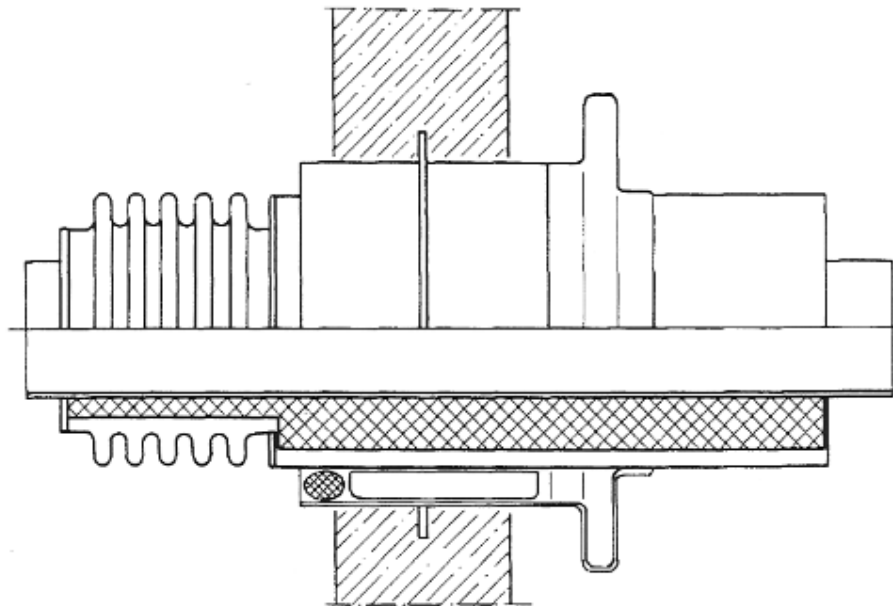
Isobrug steel-cased piping wall bushings are so designed as to be project-related and so that

1. the wall is not damaged by the longitudinal motion of the casing piping;
2. neither ground nor surface water can enter the building or shaft;
3. the bushings can take up minor axial movement of casing piping.

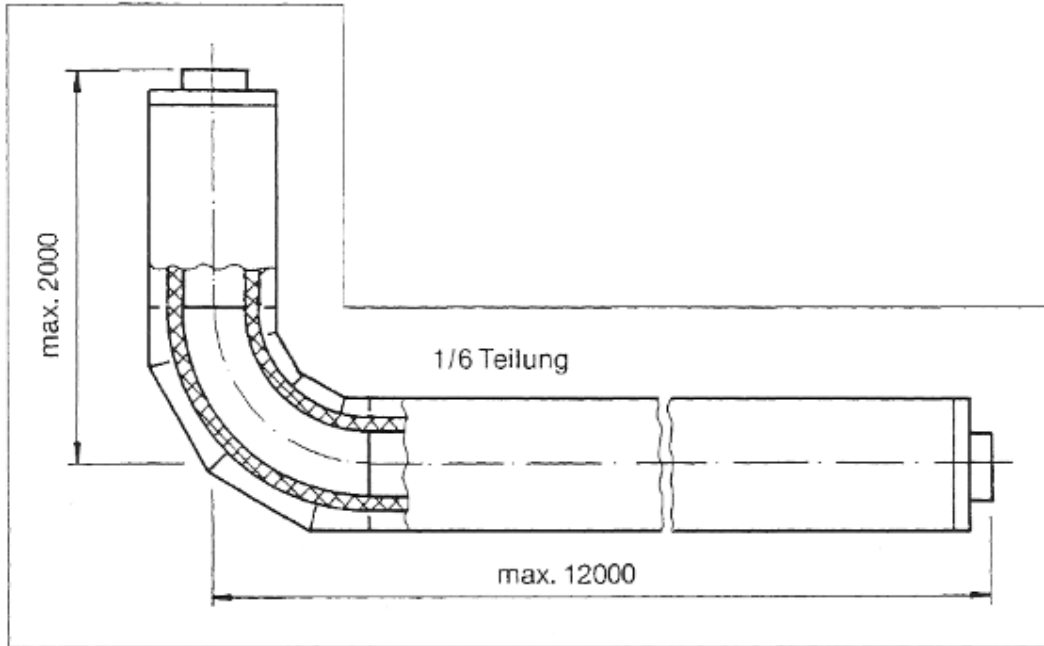
They are not suitable for high loading with earth or for subsidence's. Earth covering in the shaft area, the sand base and piping sand covering are to be carried out in accordance with the appropriate DIN, AGFW and VOB Part C standards and to be so tamped down that subsidence is impossible.

The bushings are installed on the special units ex works and then delivered to the site.

Wall entry with mild steel bellow

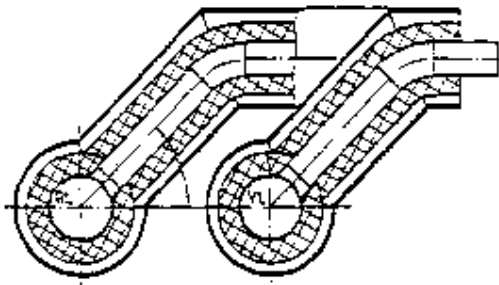


Steel cased pipe-elbow (B) at IRF

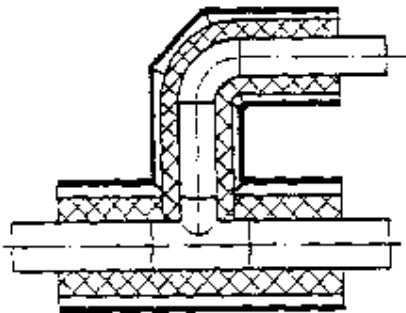


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T-branches are pre-fabricated ex works and installed in a special unit.



T-branch, single-pipe conduit
 Single-conduit outlet
 T-piece per DIN 2615 or Weldolet
 Casing pipe outlet
 Saddle piece per DIN 2618

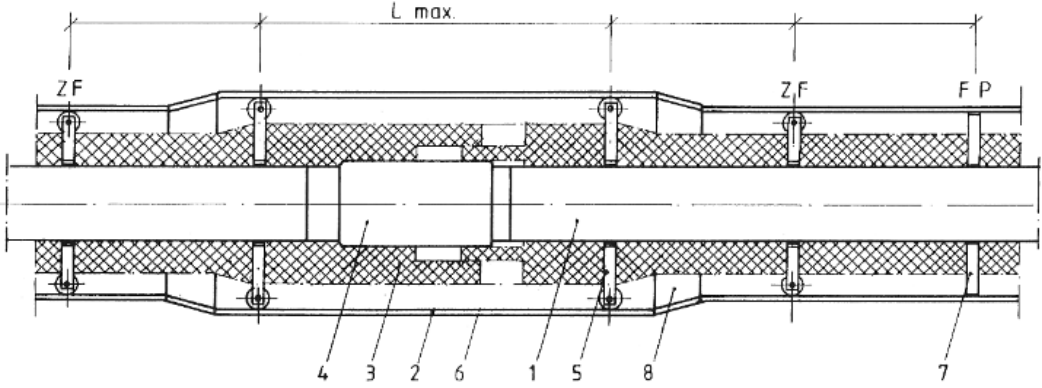


Parallel outlet, single-pipe conduit
 Carrier pipe outlet
 T-piece per DIN 2615
 Casing pipe outlet
 Saddle pieces per DIN 2618

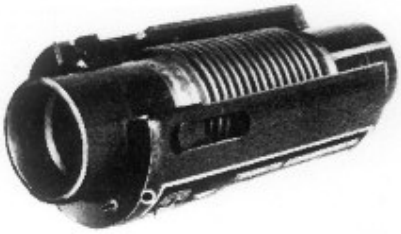


Kompensator Dehnungselement (KDE)

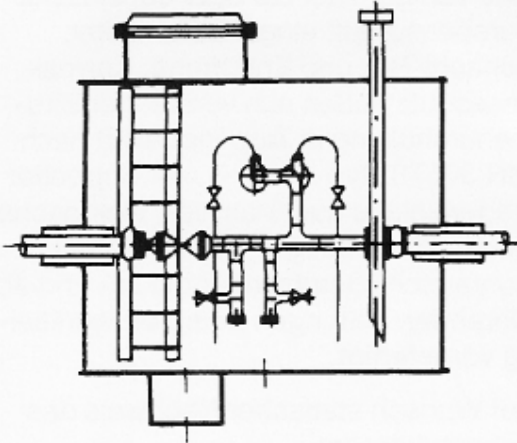
expansion compensation
by internal axial bellows
with extended casing pipe



- 1 Carrier pipe
- 2 Casing pipe
- 3 Insolation
- 4 Axial bellow
- 5 Track guide
- 6 corrosion coating
- 7 Anchor
- 8 Casing pipe extension



Side view

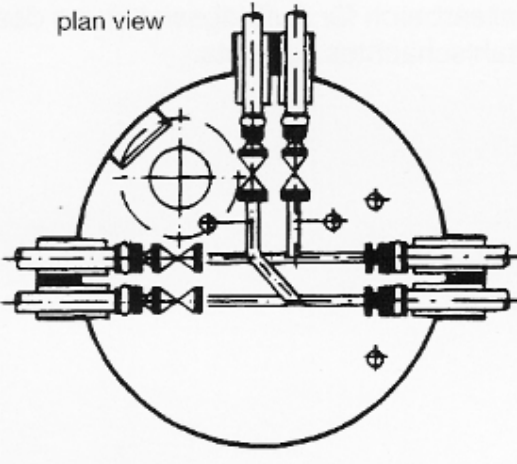


Steel shaft with access, designed for an operating loading of up to 60 SLW, including pump sump, inbuilt ladder, shaft ventilation, corrosion-proofing paint within, exterior corrosion-proofing of reinforced bitumen sheathing in tropical quality per DIN 30673 Type A, 5.5 G with double carrying layer of glass fibre matting, electrical puncture strength 20,000 V, with piping connection pieces for inlet and outlet piping, completely prefabricated ex works.

Proof of static strength supplied on demand.

Ballast concrete to hold shafting safely in place is the client's responsibility.

plan view



When constructing and operating cathodic corrosion-proof equipment, the following pre-conditions must be met:

- good electric conductivity throughout;
- perfect non-ageing piping sheathing of PE or bitumen without mechanical damage;
- the casing piping to be protected must not have any electrical contact to non-system parts or any ancillary installations.

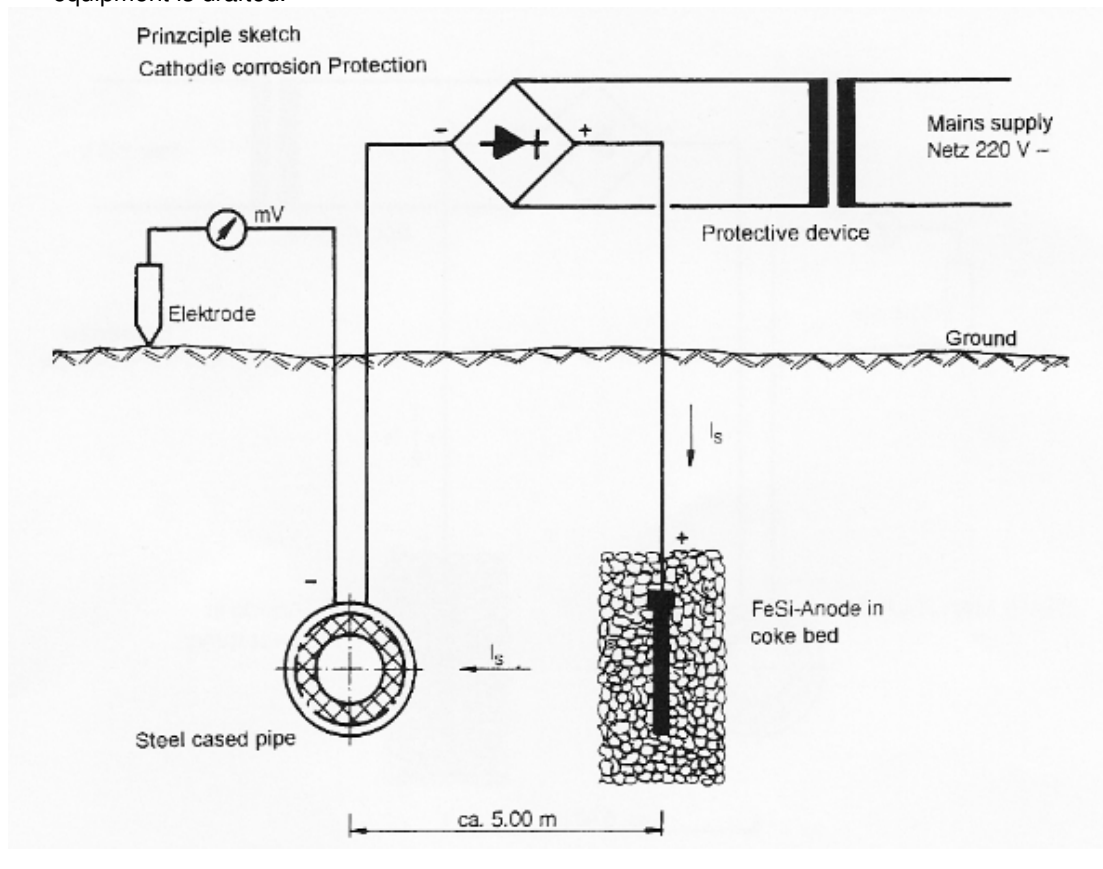
Electrical insulation from ancillary low-impedance equipment in shafting or from interconnecting stations of the piping to be protected is carried out by installing insulating flanges.

Insulating flanges consist of a flange pair electrically insulated from one another with welding socket ends and internally coated piping supports as insulant.

Note that different makers have different designs.

Design and installation of cathodic corrosion-proofing equipment for STEEL-CASED distant heat PIPING is part of our service and product range.

After installation and commissioning, a metrology protocol on testing and acceptance of the equipment is drafted.



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Cathodic corrosion proofing of STEEL-CASED PIPING

Cathodic protection of steel piping laid in the ground is state-of-the art nowadays as active corrosion protection for steel-cased distant heat piping together with passive corrosion protection (PE or bituminous sheathing of the steel-cased piping to DIN standards).

This type of plant is required to protect steel-cased piping:

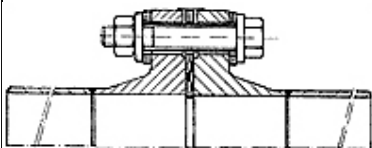
1. in corrosive soil, i.e. where soil resistance values are equal to or less than 10,000 Ohm cm;
2. in pipelines with greatly varying such values, i.e. differences equal to or larger than 10,000 Ohm cm;
3. in areas endangered by groundwater, and
4. in areas possibly subject to stray current.

Pre-conditions for our guarantee against corrosion of exterior piping protection surfaces

Please note DIN 30676, "Planning and use of exterior surface cathodic corrosion protection".

How such equipment functions can be seen in the diagram. The cathodic protective current IS is supplied by a rectifier connected to the mains. The current to the surface to be protected is via an external current anode. This is normally a Fe-Si sited in the earth at a set distance of around 5 m from the piping in a coke bed.

The number and arrangement of the Fe-Si anodes depends on the protective current needed and hence on the piping surface to be protected as well as the specific soil resistance.



INSULATING FLANGE

BRAUNSTAHL insulating flanges are adherent flange connections pre-mounted and tested for electrical penetration resistance as standard.

The standard model consists of 2 welding neck

flanges, 2 gaskets (flat or O-ring), 1 insulating ring, nuts and bolts, insulating and steel annular discs.

Only insulating materials with high electrical penetration resistance and good dielectric characteristics are used (DIN 7735 standard).

O-ring gaskets of non-ageing paracrill or other special materials only are used.

Metallic materials are selected on the basis of technical conditions of supply or the corresponding German and foreign standards and regulations.

The standard design requires dis-assembly before welding into the pipeline.

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Pre-condition for the guarantee under our Conditions of Sale is the evacuation of the steel-cased piping by an ISOBRUGG technician.

During construction of STEEL-CASED PIPING, atmospheric damp usually penetrates the insulating material and condensate builds up on the casing.

Once installation is complete, evacuation of the annular spacing with the aid of a mobile vacuum plant sucks out all the damp in the piping system as a steam-air mixture and the pressure is reduced to around 1 mbar.

A pressure increase monitor permits leak rates to be checked constantly and hence inform on whether the system remains leak proof.

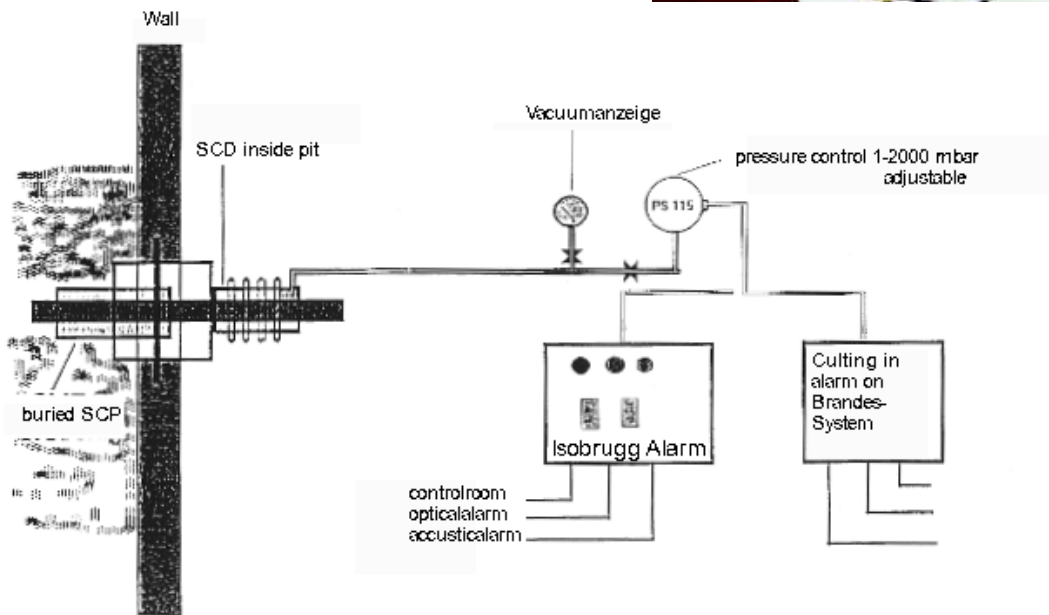
Apart from these two functions, the heat loss can also be considerably reduced if the distant heating piping is under constant vacuum

The mobile vacuum appliance consists of a vacuum pump, a refrigerating machine, a condensator, a fluid collector with automatic rapid emptying and an oil separator. The client must make 380 V AC current and a 32 A Euro plug available to operate the appliance.



**ISOBRUGG Vacuum leak detection with alarm
montion**

Principle sketch of permanent leak detection system



Technical requirements for fabrication

Please note:

works to be carried out in conjunction with the technical code and the material specification for the fabrication of steel-cased piping and also the rules for installation; codes of practice and rules for civil works such as DIN 18300, DIN 4033, DIN 4124; as well as the rules for the prevention of accidents.

All dimensions, especially angular measures, datum's, levels and trench profiles are to be checked prior to commencement of, and during, works. Notify ISOBRUGG immediately in the event of deviations.

When crane-handling steel-cased piping, use textile slings only.

In order to prevent damage to the external coating, use felt pads at support points during transport and intermediate storage.

Only welders holding the RI certificate (DN 8560) or recognised equivalents may be used.

Where indicated, carrier pipe is to be cold sprung the required distance as shown on drawing.

Transport locking elements may only be removed after aligning and tack welding carrier piping.

Within the area of site joints access holes as shown on the civil works data sheet are to be provided prior to laying and backfilling.

External coating of each unit is to be Holiday-tested with 25 kV.

The SCP units are numbered sequentially and marked accordingly at their ends.

Each unit carries the marking, "oben", denoting the twelve o'clock position. The 12 o'clock position of the carrier piping is marked by a stamped figure "0". When lining-up the units for welding, both marking must be at the top in the 12 o'clock position.

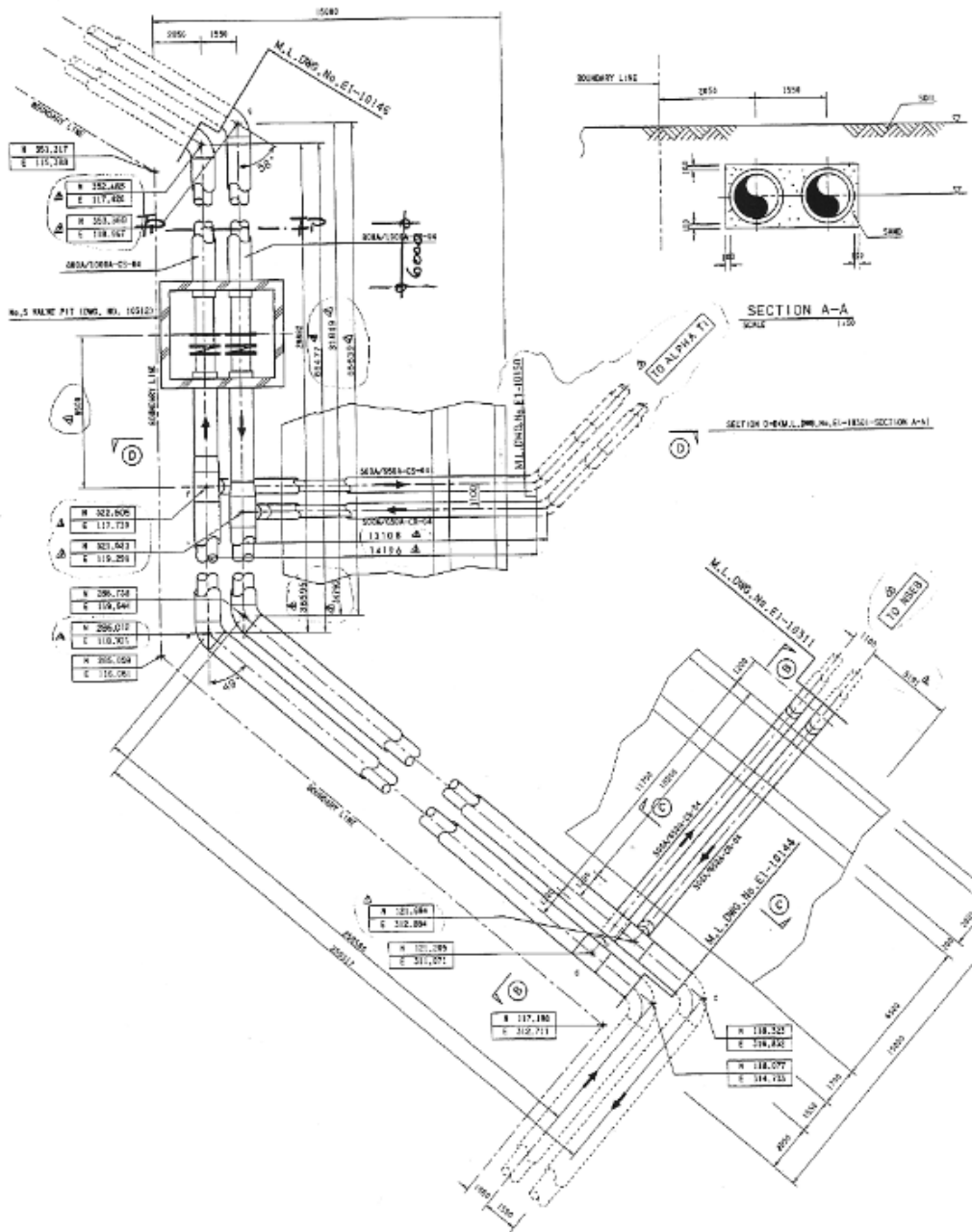
I	RF	Einrohrführung	Single-pipe conduit
II	RF	Einrohrführung	Twin-pipe conduit
	CARRIER PIPING	Innenrohr	Carrier pipe
	CASING PIPING	Mantelrohr	Casing Pipe
	IS	Isolierdicke	Insulation thickness
	VL	Vorlauf	Flow
	RL	Rücklauf	Return
	D	Dampf	Steam
	K	Kondensat	Condensate
	BW	Brauchwasser	Domestic hot water
	Z	Zirkulation	Circulation

Betriebsdaten: Operating data

Betriebsdruck	Operating pressure	9 bar	Auslegungsdruck	Design pressure	25 bar
	Operating pressure	14 bar	"	"	" "
	Operating pressure	21 bar	"	"	" "

Temp.- 210 C (1 = 2.5 mm/m)

LA	Axiallager	Alignment support	Δ L	Innenrohrausdehnung	Linear expansion of carrier p
LP	Lagerplatte	Support plate	Δ I	Ausdehnungskoeffizient	Linear co-efficient expansion
ZF	Zwangsführung	Track guide	kon	Konzentrisch	Concentric
FP	Festpunkt	Intermediate anchor	ex.	Exzentrisch	Eccentric
MD	Mauerdurchführung	Wall entry	MRR	Mantelrohrreduzierung	Casing reducer
AKV	Axialkomp.-Verschluß	Bellow type termination	IRR	Innenrohrreduzierung	Carrier pipe reducer
AK	Axialkomp im Innenrohr	Axial Bellow	TA	T-Zweig	T-branch
B	Bogen	Bend	BVS	Verschlußkappe	Capped ends
L	Linse	MS Bellow	BE	Baueinheit	Special unit
			BV	Baustellenverbindung	Site joint
				Mantelrohr - Halbschale	Casing pipe makeup piece
				Mantelrohr beiziehen	Casing pipes abutted



Thermal insulation selection table (standard)

Economic thicknesses of mineral wool make-up pieces for various piping dimensions and operating temperatures.

Given details of the ground conditions, lambda values for the soil, average soil temperature, the dimensions of the carrier and casing piping, medium temperature and corresponding insulation thickness, the heat loss of Isobrugg steel-cased piping can be calculated.

For larger projects and lengthier transport piping, especially at high operating temperatures, steel-cased piping systems should be operated with permanent vacuum. The insulation thicknesses in the table can then be reduced without affecting heat loss.

Dimension carrier pipe	Temperature °C											
	60	80	100	120	140	160	180	200	220	240	270	300
	Insulationthickness											
DN 25 – 40	30	30	30	30	40	40	50	50	60	60	70	70
DN 50 – 65	30	30	30	40	40	50	50	50	60	60	70	80
DN 80 – 100	30	30	40	40	50	50	60	70	80	80	90	90
DN 125	30	30	40	50	60	60	70	80	80	90	90	100
DN 150	30	40	40	50	60	70	70	80	80	90	90	100
DN 200	40	40	50	60	60	70	70	80	80	90	90	100
DN 250	40	50	60	60	70	80	90	90	100	100	110	110
DN 300	40	50	60	70	80	90	100	100	110	110	120	120
DN 350	40	50	60	70	80	90	100	100	110	110	120	120
DN 400	50	60	70	80	90	100	100	110	110	120	120	130
DN 450	50	60	70	80	90	100	100	110	110	120	130	130
DN 500	50	60	70	80	90	100	100	110	110	120	130	130

Table heat expansion for steel pipes

Steel pipes material St. 37.0 S and St. 52. thermal expansion coefficient ΔL in mm/m at a reference temperatur of 10°C and operating temperatures t in °C

t in °C	t -Diff. K	coeffic mm/m	ΔL mm/m
10	0	0,0123	0,000
20	10	0,0123	0,123
30	20	0,0123	0,246
40	30	0,0123	0,369
50	40	0,0123	0,492
60	50	0,0123	0,615
70	60	0,0123	0,738
80	70	0,0123	0,861
90	80	0,0123	0,984
100	90	0,0123	1,107
110	100	0,0130	1,300
120	110	0,0130	1,430
130	120	0,0130	1,560
140	130	0,0130	1,690
150	140	0,0130	1,820
160	150	0,0130	1,950
170	160	0,0130	2,080
180	170	0,0130	2,210
190	180	0,0130	2,340
200	190	0,0130	2,470
210	200	0,0135	2,700
220	210	0,0135	2,835
230	220	0,0135	2,970
240	230	0,0135	3,105
250	240	0,0135	3,240
260	250	0,0135	3,375
270	260	0,0135	3,510
280	270	0,0135	3,645
290	280	0,0135	3,780
300	290	0,0135	3,915

Carrier pipe data table seamless steel pipes

acc DIN 2448/EN 10216, material St. 37.0 S - Standard

dim	dia mm	wall thichn mm	area of sect mm ²	weight kg/m	internal dia mm	volume Liter	displm. dm ³ /m
25	33,7	2,6	254	1,99	28,5	0,64	0,89
32	42,4	2,6	325	2,55	37,2	1,09	1,41
40	48,3	2,6	373	2,93	43,1	1,46	1,83
50	60,3	2,9	523	4,11	54,5	2,33	2,86
65	76,1	2,9	667	5,24	70,3	3,88	4,55
80	88,9	3,2	862	6,76	82,5	5,35	6,21
100	114,3	3,6	1252	9,83	107,1	9,01	10,26
125	139,7	4,0	1705	13,39	131,7	13,62	15,33
150	168,3	4,5	2316	18,18	159,3	19,93	22,25
175	193,7	5,6	3309	25,98	182,5	26,16	29,47
200	219,1	6,3	4212	33,06	206,5	33,49	37,70
225	244,5	6,3	4714	37,01	231,9	42,24	46,95
250	273,0	6,3	5279	41,44	260,4	53,26	58,53

Carrier pipe data table welded steel pipes

acc DIN 2448/EN 10217, material St. 37.0 WA or WB, Standard.

WA = welding valmcl 0,9

WB = welding valmcl 1,0

dim	dia mm	wall thichn mm	area of sec mm ²	weight kg/m	internal dia mm	volume Liter	displm. dm ³ /m
25	33,7	2,0	199	1,56	29,7	0,69	0,89
32	42,4	2,0	254	1,99	38,4	1,16	1,41
40	48,3	2,3	332	2,61	43,7	1,50	1,83
50	60,3	2,3	419	3,29	55,7	2,44	2,86
65	76,1	2,6	600	4,71	70,9	3,95	4,55
80	88,9	2,9	784	6,15	83,1	5,42	6,21
100	114,3	3,2	1117	8,77	107,9	9,14	10,26
125	139,7	3,6	1539	12,08	132,5	13,79	15,33
150	168,3	4,0	2065	16,21	160,3	20,18	22,25
175	193,7	4,5	2675	21,00	184,7	26,79	29,47
200	219,1	4,5	3034	23,82	210,1	34,67	37,70
225	244,5	5,0	3762	29,53	234,5	43,19	46,95
250	273,0	5,0	4210	33,05	263,0	54,33	58,53
300	323,9	5,6	5600	43,96	312,7	76,80	82,40
350	355,6	5,6	6158	48,34	344,4	93,16	99,31
400	406,4	6,3	7919	62,16	393,8	121,80	129,72
450	457,2	6,3	8924	70,06	444,6	155,25	164,17
500	508,0	6,3	9930	77,95	495,4	192,75	202,68
550	558,8	6,3	10935	85,84	546,2	234,31	245,25
600	609,6	6,3	11941	93,73	597,0	279,92	291,86
650	660,4	7,1	14572	114,39	646,2	327,96	342,53
700	711,2	7,1	15705	123,29	697,0	381,55	397,26

Casing piping table (standard)

Casing piping dimensions per DIN 2458/EN 10217 in St. 37.0 WA material - works certification per DIN 50049-2.2

Insofar as thicker walls may be needed for construction engineering reasons, e.g. due to inadequate covering, larger casing piping can be used without hesitation.

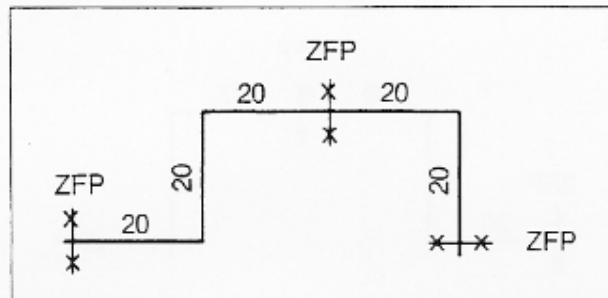
dim	dia mm	wall thichn mm	area of sect mm ²	weight kg/m	internal dia mm	volume n Liter	int. section dm ²
125	139,7	3,6	1539	16,9	132,5	13,79	1,38
150	168,3	4,0	2065	22,1	160,3	20,18	2,02
200	219,1	4,0	2703	30,8	211,1	35,00	3,50
250	273,0	4,0	3380	34,6	265,0	55,15	5,52
300	323,9	4,0	4020	42,7	315,9	78,38	7,84
350	355,6	4,0	4418	46,2	347,6	94,90	9,49
400	406,4	4,0	5057	53,0	398,4	124,66	12,47
450	457,2	4,5	6400	65,0	448,2	157,77	15,78
500	508,0	5,6	8839	85,2	496,8	193,84	19,38
550	558,8	5,6	9732	104,0	547,6	235,51	23,55
600	609,6	6,3	11941	114,0	597,0	279,92	27,99
650	660,4	6,3	12946	123,0	647,8	329,59	32,96
700	711,2	7,1	15705	147,0	697,0	381,55	38,16
750	762,0	8,0	18950	172,0	746,0	437,09	43,71
800	812,8	8,0	20227	184,0	796,8	498,64	49,86
900	914,4	10,0	28413	252,0	894,4	628,28	62,83
1000	1016,0	10,0	31604	280,0	996,0	779,13	77,91
1100	1120,0	11,0	38324	336,0	1098,0	946,88	94,69
1200	1220,0	12,5	47418	410,0	1195,0	1121,57	112,16

One means of increasing expansion length results from the extension of the casing piping in the expansion bend areas. The expansion of casing piping DN 350 to casing piping DN 400 results in an increase in ring gap from 19.8 mm to 45.2 mm and in expansion take-up to a total of 90.4 mm, which means the expansion length can be increased to about 40 m instead of the former approximately 20 m.

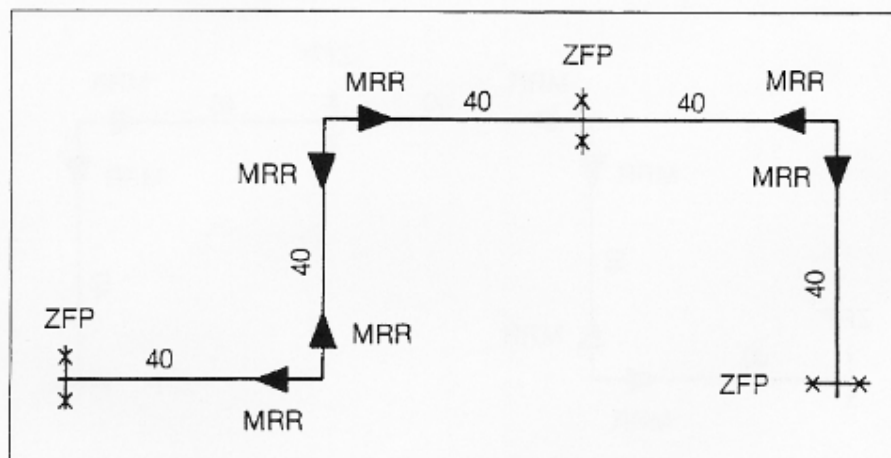
Depending on pipeline profile, casing piping extension of up to four times the dimensions is possible, so that carrier piping expansion at 50% pre-stress of up to 200 mm can be compensated for.

The natural expansion compensators such as U- Z- and L-bends can also be replaced with full-protection bellows-type axial compensators, whereby the normal casing piping usually need not be changed.

Example: IRF/IR DN 150/IS 70 mm/MR DN 350



Example: IRF/IR DN 150/IS 70 mm/MR DN 350
IRF/IR DN 150/IS 70 mm/MR DN 400

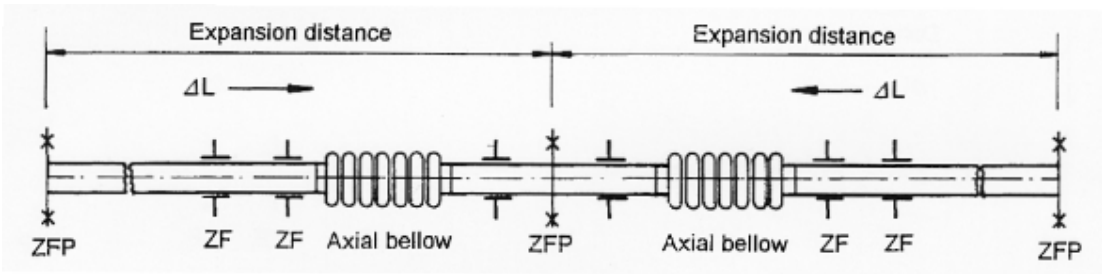


Steel-cased piping compensatory expansion elements

Insofar as natural expansion compensators such as U-, L- or Z-bends are inadequate, bellows-type joints can be substituted. These are also welded to the carrier piping ex works and installed in the steel-cased piping with anchors and guide supports according to the maker's regulations. Two expansion elements can be installed in any one special unit, i.e. one intermediate anchor and two compensators with track guides as per system diagram can be installed to take up the expansion from both directions like a U-bend expansion compensator. With special track guides, bellows-type axial compensators can also be used with twin-pipe conduits.

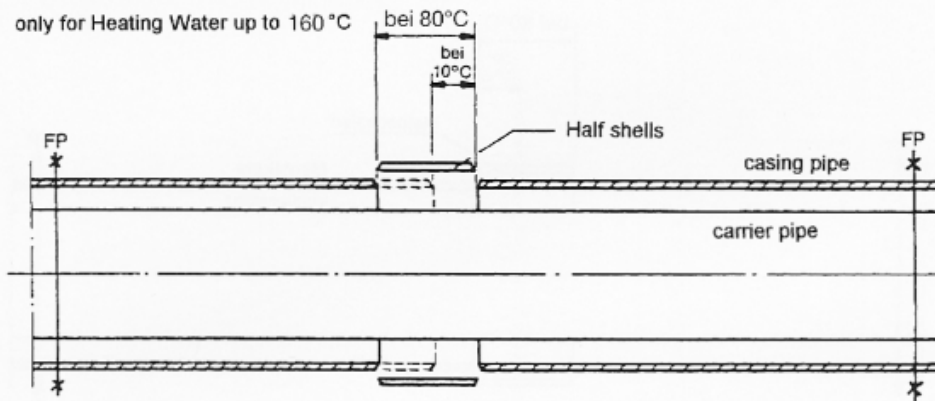
Only so-called "FULLY PROTECTIVE COMPENSATORS" with external protective piping, interior guide tubing, lift limitations devices, pre-stress safety devices, torsion safety devices and their own guide devices are suitable for installation in a steel-cased piping system.

The service life of a compensator is dependant on temperature, pressure, load, load change intervals, fluid medium hammering, corrosion and installation errors.



Thermal prestressed SCP - Lines

only for Heating Water up to 160 °C



Mechanical prestressed SCP - Lines

