



Technology  
for Pipelines  
Corrosion Prevention



# DENSOLEN®

**Polyethylene - Butyl-Rubber Composite Tapes  
and Tape Systems for the Reliable Corrosion  
Protective Coating of Buried Steel Pipes, Bends,  
Joints and Fitting**



[www.denso.de](http://www.denso.de)

## History



**DENSOLEN**<sup>®</sup>-Tapes and Tape-Systems have been used for more than 40 years for the reliable corrosion protection of buried pipes, joints, bends and

fittings. The trend-setting development of **DENSOLEN**<sup>®</sup>-Tapes started in 1971 with the **DENSO** invention of the first three-ply composite tape (**DENSOLEN**-Tape S40),

which was later improved by development of asymmetrical three-ply tapes, which are preferably used today.

Since 1971 such tapes have been successfully employed in construction of cross country and distribution pipelines as well as in pipeline rehabilitation. By permanent further development, including new high performance polyethylene compounds, **DENSOLEN**<sup>®</sup>-Tape Systems still represent the state of the art in corrosion prevention tape technology.

## Fields of Application

**DENSOLEN**<sup>®</sup>-Tape systems are used for versatile fields of application in construction and rehabilitation of buried metal pipelines. In particular, this covers the wrapping of

- welded joints
- full pipe lengths
- bends
- reducers
- branches
- fittings

**DENSOLEN**<sup>®</sup>-Tapes can effectively be used on all pipe diameters by employment of adjusted tape widths and suitable **DENSOMAT**<sup>®</sup> wrapping machines.



## Range of Tapes



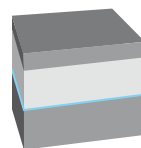
The **DENSOLEN**<sup>®</sup>-Tape family can be classified according DIN 30672 and DIN 12068 as follows:

**DENSOLEN**<sup>®</sup> three-ply tapes are symmetrically or asymmetrically structured plastic tapes with stabilised polyethylene

carrier film and butyl rubber adhesive layers on both sides. They are used as innerwrap and outerwrap in **DENSOLEN**<sup>®</sup> one- and two-tape systems.

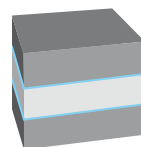
**DENSOLEN**<sup>®</sup> two-ply tapes consist of a stabilised polyethylene carrier film with a butyl rubber adhesive layer on one side. Tapes of this type are generally used as outerwrap in **DENSOLEN**<sup>®</sup> two-tape systems.

By their thin incorporated PE film, butyl rubber tapes represent the most flexible type of all **DENSOLEN**<sup>®</sup>-Tapes. Such tapes are particularly easy to apply. In special tape systems, butyl rubber innerwrap tapes are combined with mechanically protecting two-ply outerwrap tapes.



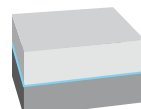
**three-ply tape (asymmetrical)**

butyl rubber  
PE carrier film  
co-ex intermediate layer  
butyl rubber



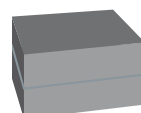
**three-ply tape (symmetrical)**

butyl rubber  
co-ex intermediate layer  
PE carrier film  
co-ex intermediate layer  
butyl rubber



**two-ply tape**

PE carrier film  
co-ex intermediate layer  
butyl rubber



**butyl rubber tape**

butyl rubber  
thin PE film (< 150 µm)  
butyl rubber

## DENSOLEN®-Tapes

DENSOLEN®-Tape	AS40 Plus	AS39P	AS50	N60
Cross section				
Type	Three-ply tape (asymmetrical)	Three-ply tape (asymmetrical)	Three-ply tape (asymmetrical)	Three-ply tape (asymmetrical)
Tape thickness	0,8 mm	0,8 mm	1,1 mm	1,2 mm
Thickness carrier film (app.)	0,28 mm	0,28 mm	0,50 mm	0,14 mm
Colour outer layer	yellow or black	black	black	grey
Colour inner layer	grey	grey	grey	grey

DENSOLEN®-Tape	ET100	S10	S20	R20HT
Cross section				
Type	Butyl rubber tape	Butyl rubber tape / three-ply tape	Butyl rubber tape / three-ply tape	Two-ply tape
Tape thickness	1,0 mm	0,8 mm	0,5 mm	0,5 mm
Thickness carrier film (app.)	25 µm	0,15 mm	0,28 mm	0,3 mm
Colour outer layer	black	black	black	black or white
Colour inner layer	black	grey	grey	black

## Tape Systems

**DENSOLEN®**-Tapes can be combined into tape systems in different ways. All systems have in common, that a three-ply tape or a butyl rubber tape are used for the innerwrap. Only tapes of these types self-amalgamate in the overlap areas, forming a sleeve-type coating, which is impermeable to water vapour and oxygen.

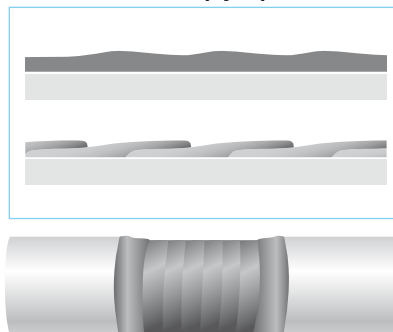
Mechanical protection can be provided by three-ply or two-ply tapes. Utilisation of three-ply outerwrap tapes results in self-amalgamation between all tape layers, while a smooth polyethylene finish is

achieved by use of cost saving two-ply outerwrap tapes.

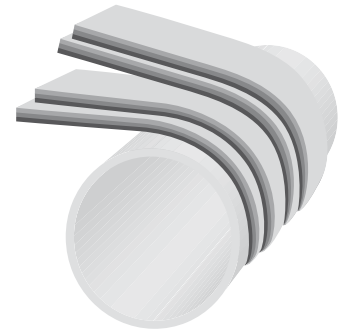
One-tape systems are characterised by use of only one tape for inner- and outerwrap, whereas in two-tape systems different tapes are employed for inner- and outerwrap.

All **DENSOLEN®**-Tape systems are applied onto a coat of **DENSOLEN®**-Primer, a solution of butyl rubber and hydrocarbon resins in organic solvents. The primer facilitates and improves tape adhesion to steel surface and adjacent mill coating.

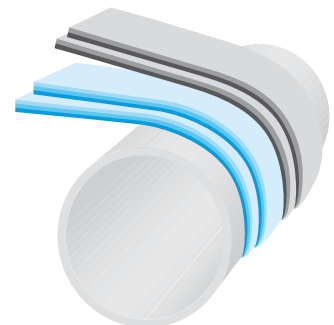
### Impermeable self-amalgamation of **DENSOLEN®** three-ply tapes



### **DENSOLEN®** One-tape System



### **DENSOLEN®** Two-tape System





## DENSOLEN®-Tape Systems

DENSOLEN® Tape System	N60-S20	AS40 Plus	AS39P-R20HT	AS40 Plus-R20HT	AS50	ET 100-R20HT
Stress class according to DIN EN 12068 / DIN 30672	C-50	C-50	C-50	C-50	B-50	-
max. continuous operating temperature	+50 °C	+50 °C	+50 °C	+50 °C	+50 °C	+100 °C
One-tape system		✓			✓	
Two-tape system	✓		✓	✓		✓
DIN-DVGW Reg.-No.	NV-5180BN0071	NV-5180AL0188	NV-5180B00176	DV-5180BT0429	-	-
Special advantages	<ul style="list-style-type: none"> <li>thick butyl rubber inner layer</li> <li>self-amalgamating between all tape layers</li> <li>stress-class C-50 system</li> </ul>	<ul style="list-style-type: none"> <li>one-tape system</li> <li>self-amalgamating between all tape layers</li> <li>stress-class C-50 system</li> </ul>	<ul style="list-style-type: none"> <li>stress-class C-50 system</li> <li>cost saving solution</li> <li>self-amalgamating innerwrap</li> </ul>	<ul style="list-style-type: none"> <li>stress-class C-50 system</li> <li>cost saving solution</li> <li>self-amalgamating innerwrap</li> </ul>	<ul style="list-style-type: none"> <li>one-tape system</li> <li>only one wrapping operation</li> <li>self-amalgamating innerwrap</li> </ul>	<ul style="list-style-type: none"> <li>high temperature tape system</li> <li>specialty formulated innerwrap tape</li> </ul>

## System structure

Primer	DENSOLEN®-Primer	DENSOLEN®-Primer	DENSOLEN®-Primer	DENSOLEN®-Primer	DENSOLEN®-Primer	DENSOLEN®-Primer
Innerwrap: DENSOLEN®-Tape	N60	AS40 Plus	AS39P	AS40 Plus	AS50	ET100
Innerwrap tape layers	2	2	2	2	2	2
Outerwrap: DENSOLEN®-Tape:	S20	AS40 Plus	R20HT	R20HT	-	R20HT
Outerwrap tape layers	2	2	2	2	-	2
Total thickness	3,4 mm	3,2 mm	2,6 mm	2,6 mm	2,2 mm	3,0 mm
Additional mechanical protection	optional, depending on soil conditions	optional, depending on soil conditions	optional, depending on soil conditions	optional, depending on soil conditions	optional, depending on soil conditions	DENSOLEN®-Rockshield DRM-PP 1000 Plus

Required mechanical resistance as well as ease of application have to be considered, when combining **DENSOLEN®**-Tapes into tape systems. Two-tape systems with highly conformable butyl rubber innerwrap tapes are particularly suitable for wrapping of irregularly shaped installations. In case of pipes, joints and bends, the mechanically more resistant stress-class C-50 tape systems should preferably be used. All **DENSOLEN®**-Tapes and -Systems are subjected to a thorough quality control according to national and international corrosion protection standards. Above that, DIN-DVGW certified tape systems are annually checked by the independent DVGW test laboratory.

## Supplementary Products



### DENSOLEN®-Mastic

Viscous butyl rubber mastic for filling of voids. For subsequent wrapping with **DENSOLEN®**-Tape systems



### DENSOLEN®-Rockshield DRM-PP

Rot proof polypropylene fibre fleece material for the additional mechanical protection of corrosion protective coatings.



### DENSOMAT®-Wrapping Machines

for spiral wrapping of pipes from DN80 and bends from DN100. **DENSOMAT®** Wrapping Machines facilitate the application of **DENSOLEN®**-Tapes with constant tape tension and overlap.