EMS Surveillance System

Swede Electronics A/S

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Swede Electronics A/S

Company profile

Swede Electronics A/S develops and manufactures alarm- and surveillance systems, mainly for the district heating industry.

All necessary components for building a complete surveillance system are included in the product programme: Fault locators, detectors, cables, connecting boxes, end components etc.

The EMS surveillance system is based on the well-known simple copper wire principle, characterised by great reliability and by being economic attractive during installation as well as operation.
The wires are robust and easily installed during pipe manufacture and system assembly.

Design

System structure

A surveillance system consists of:

- Embedded copper wires in the delivered pre-insulated pipes
- Components for connection of equipment
- Measuring equipment for permanent surveillance
- Circuit diagram of the total surveillance system.

Design and documentation of the wire run in a specific surveillance system are therefore an essential factor for the utilization of the surveillance system for fault location.
With a surveillance system a fault is measured by means of the wire length to the fault location independent of the chosen system:

- Reference point system
- Detector system

Symbols

When designing an EMS surveillance system a set of symbols is used to show where to use the specific components, and also the electric length of each connected cable for connection of detector, check points or jumper cables in the system
The tinned wire in the pipes is used for surveillance of the pipe system and is marked on the circuit diagram with a full-drawn line.
The copper wire in the pipes is used as a signal wire, i.e. for relay or data transmissions from each unit in the system to a central surveillance, placed e.g. in the district heating station. It is also used when the signal is transmitted back and forth in the same pipe.
The copper wire is marked in the circuit diagram with a broken line.
See the paragraph, symbol key.

Diagram structure

Design the circuit diagram so the highest possible utilization and accuracy are obtained when measuring the chosen system.
For all types it is advantageous with as many check points (reference points) as possible. Max. distance between the checkpoints must be 500 m wire.

Check points are easily and in an inexpensive way established in connection with a branch where the wires are connected forth and back in the same pipe to the consumer. Max. length of this wire connection is 100 m.
Checkpoints can also be established when connecting cables to a cabinet and back to the same muff. This method is used for transmission lines where there typically are no consumers.
To maintain the accuracy in the surveillance system the total length of cables in the system must not exceed 10 % of the total wire length.
See example of circuit diagram

Making diagrams

It is vital that the circuit diagram is finish before pipes are installed so the wire position can be correct.
It is also vital that all changes of the pipe run are noted so a correct “as built”-diagram can be made.
Correspondence between diagram and pipe drawing is a condition of correct location of a possible malfunction.
Swede Electronics A/S offers its assistance with the preparation of diagrams for surveillance systems.

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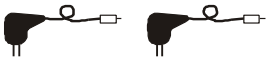
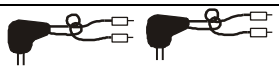
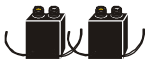
Symbol key for the components

Signature	Part. no.	Name	Illustration	Physical length metre	Electrical length metre
		Cables:			
		Single cable – open mirror:			
	1250	Single cable connection		8,89	10,00
	1255	Single cable connection		1,71	2,00
	1256	Single cable connection		4,40	2,00
	5054	Single cable connection		14,30	16,02
		Other lengths on request.			
		Twin cable – open mirror:			
	1251	Twin cable connection		4,40	5,00
	1254	Twin cable connection		8,89	10,00
	5000	Twin cable connection		20,00	22,36
	5001	Twin cable connection		10,00	11,23
	5002	Twin cable connection		30,00	33,49
	5009	Twin cable connection		15,00	16,80
	5011	Twin cable connection		25,00	27,93
	6111	Twin cable connection		3,50	4,00
	6114	Twin cable connection		5,20	5,89
		Twin cable – closed mirror:			
	6056	Twin cable connection		8,89	10,00
	6068	Twin cable connection		15,00	16,80
	6074	Twin cable connection		20,00	22,36
		Other lengths on request.			
	1252	Double cable connection		8,19	10,00
		Connecting link cable:			
	1210	Cable, 1 m		0,90	1,00
	1216	Cable, 3 m		2,69	3,00
	1212	Cable, 5 m		4,49	5,00
	1213	Cable, 10 m		8,98	10,00

	1214	Cable, 15 m		13,47	15,00
	1215	Cable, 20 m		17,96	20,00
	1216	Cable, 25 m **Other lengths on request.**		22,45	25,00
		Jumper cable – open mirror:			
	1253	Jumper cable		4,76	7,00
	1258	Jumper cable		2,50	4,48
	5056	Jumper cable		3,00	5,04
	6022	Jumper cable		12,00	15,06
	6038	Jumper cable		10,00	12,83
	6055	Jumper cable		1,10	2,92
		Jumper cable – closed mirror:			
	6092	Jumper cable		5,00	5,67
	6115	Jumper cable		3,60	4,11
	6120	Jumper cable **Other lengths on request.**		1,60	1,88
		Connection boxes/components:			
	1230	Connecting box			
	1231	Junction box			
	1232	Junction box for 2 single cables			
	1233	Y-box			
	1235	Double Y-box			
	1300	End component, red for detector			
	1301	Adaptor box, red			
	1302	End component, black			

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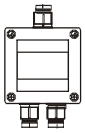
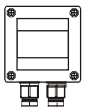
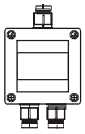
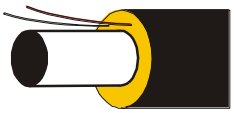
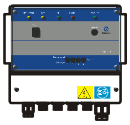
	1303	Adaptor box (black)			
	1308	End component (blue)			
	1309	Adaptor box (blue)			
C	1516	Connection box			
	1517	Terminal box			
O	1518	Extension box			
		Accessories:			
		Tinned copper wire Copper wire			
	1200 1201	Earth connection, short Earth connection, long			
	1220 1221	Connecting link Cable installation set			
F	1304	Fault simulator			
	1305	Connecting link for relay			
	1400	Small cabinet Large cabinet			

		Detectors:			
D	2000	Detector, 1 circuit			
D 1 2	2020	Detector, 2 circuits			
D 1 2 3 4	3000	Detector, 4 circuits			
D 1 2 3 4 5 6 7 8	8000	Detector, 8 circuits			
DLD 1 2 3 4	8001	Detector, 4 circuits, long distance			

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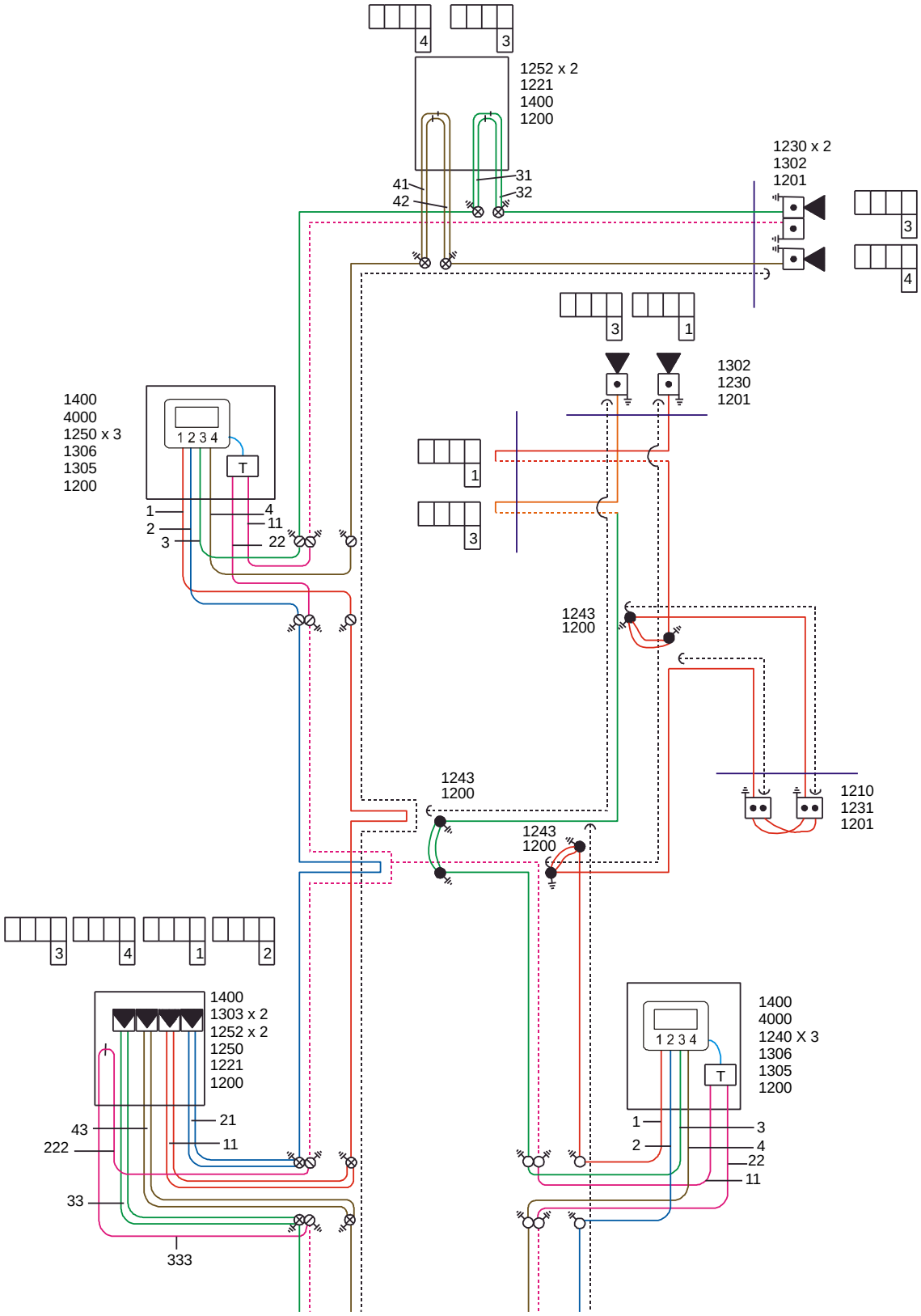
Example of circuit diagram, made in accordance with symbol key



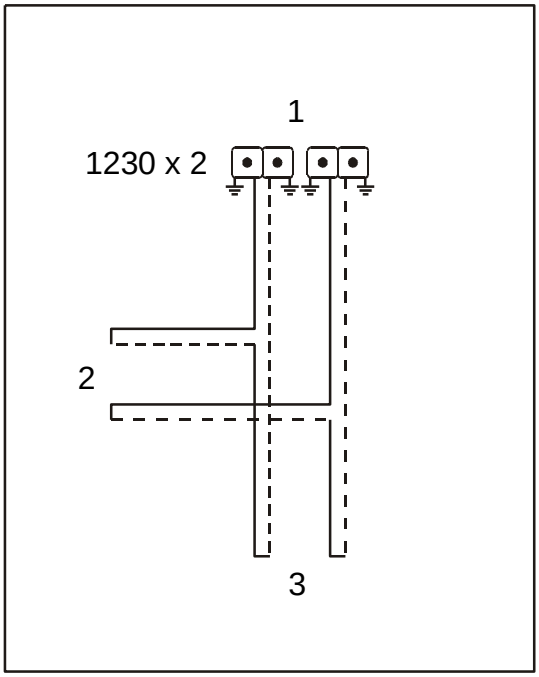
Reference point system

Description

This system is typically used between blocks of flats, inspection chambers etc.
Connect wires so they can be inspected from, for example, a cellar room by means of an external instrument e.g. a megger.
In case of fault the fault location is measured with a pulse reflectometer.

Design

This example is between 3 blocks of flats.
In building no. 1 tinned wires and copper wires are connected to connecting box no. 1230.
In buildings nos. 2-3 the wires are looped to obtain a circuit for each pipe.
Checking and measuring of malfunctions can be done from building no. 1.
Also see symbol key



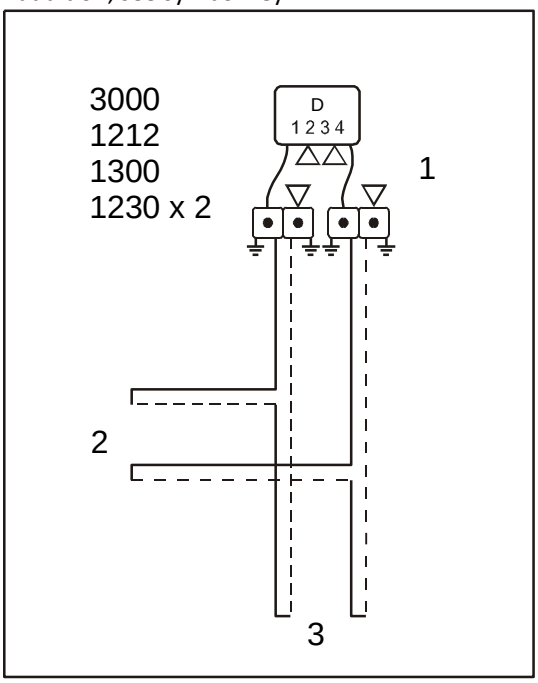
Detector system

Description

Unlike a reference point system, this system permanently monitors the pipe system with the connected detector.
In case of fault the fault location is measured with a pulse reflectometer.

Connection of detector in building

Detector 3000, installed in building no. 1 with cable 1212 to connecting boxes 1230 on the tinned wire.
End component 1300 is used where the circuit ends (the copper wire).
Install end component in the two circuits which are not used on the detector.
Each circuit can max. monitor 1000 m wire.
If the system is shorter than 1000 m, a 1-circuit detector 2000 may be used.
In addition, see symbol key



Connection of detector on pipe run

Detector 3000, installed in cabinet and connected to the pipe system with cable 1240.
With this method all 4 circuits can be used with max. 1000 m.
Each circuit ends in a building with connecting boxes 1230, installed with end component 1300.
The copper wires in the main pipe are not used, but connected and may later be used to transmit signals.
Moreover, see symbol key

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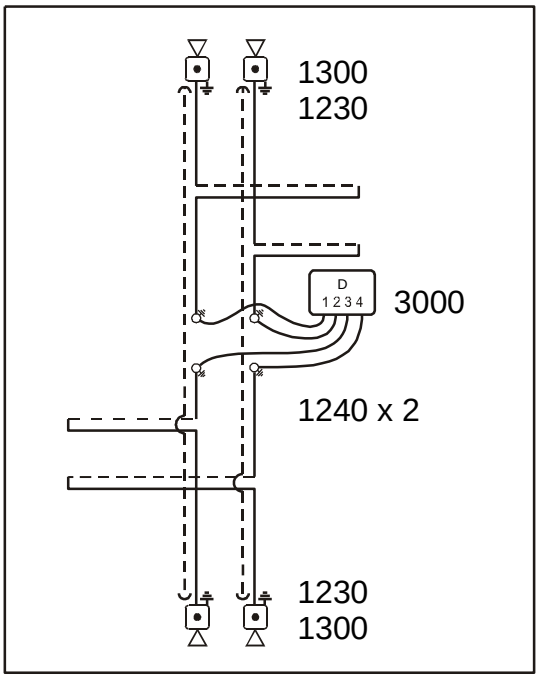
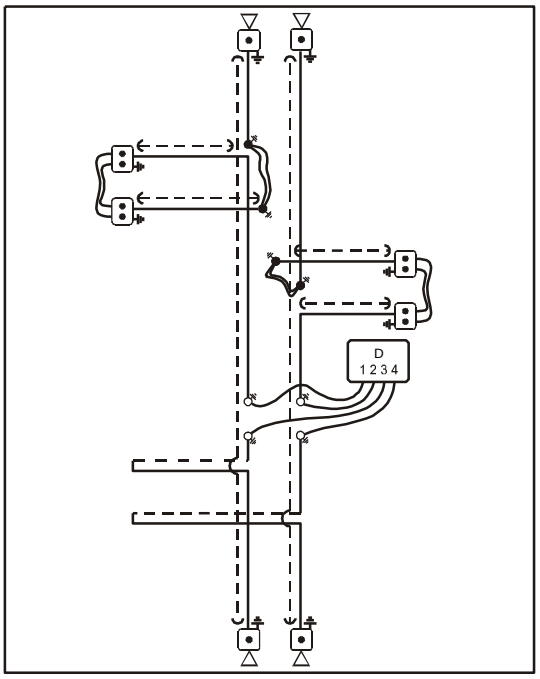


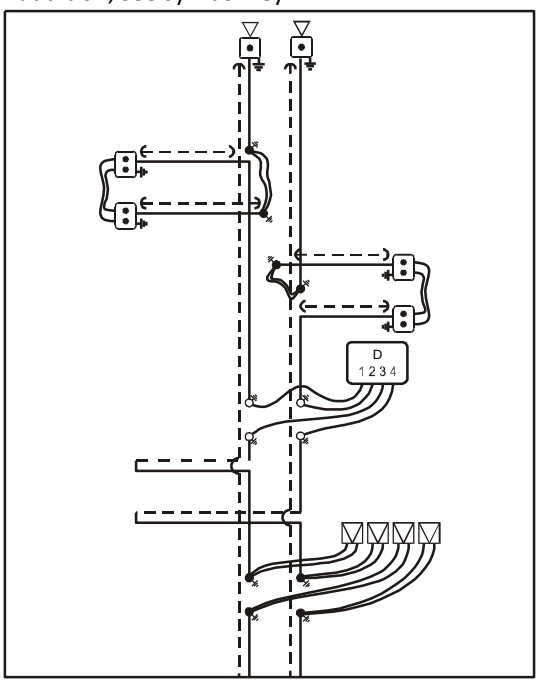
Jumper cable

If the length of a branch is more than 100 m, connection back and forth in the same pipe cannot be used.
Or if the length of the single circuit is more than 1000 m, design with jumper cables as in the example shown may be used. It will reduce wire length.
The tinned wire is connected in the building with jumper cable between the 2 pipes. Here 1231 coupling box and 1210 cable are used for connection.
For branches jumper cable 1243 is used between the 2 muffs so one circuit now monitors the 2 pipes.
At the next branch the second circuit is used for the same connection method, so the measuring lengths are used optimally.
In addition, see symbol key and diagram



Ending in muff

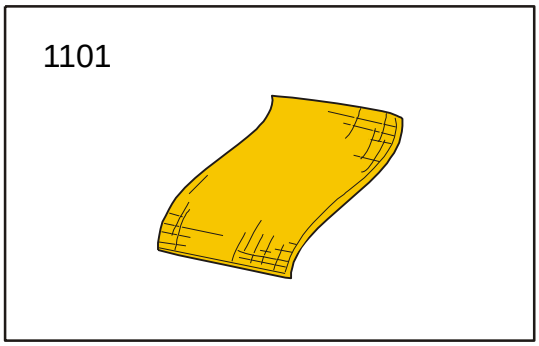
A circuit can also be ended with an end component from a muff, when max. length of 1000 m has been reached with a detector.
Here design is made with a cable no. 1242 that is led to the cabinet where adaptor box no. 1301 is connected to the cables.
In addition, see symbol key



Catalogue

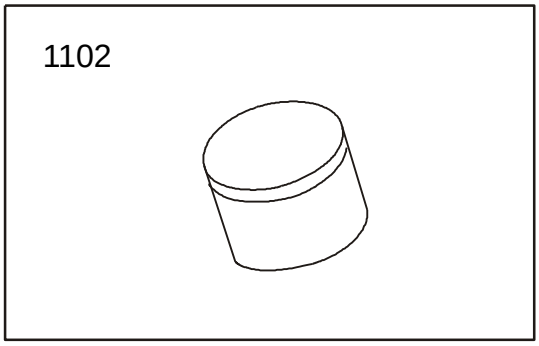
1101

Cleaning cloth (10 cloths)
Clean the wire ends with a synthetic cleaning cloth.



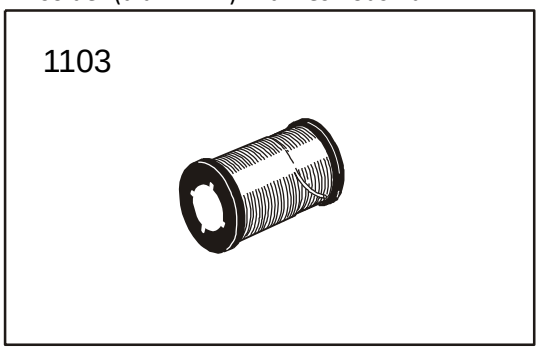
1102

Soldering paste
Acid-free soldering paste increases the flow ability of the tin solder.



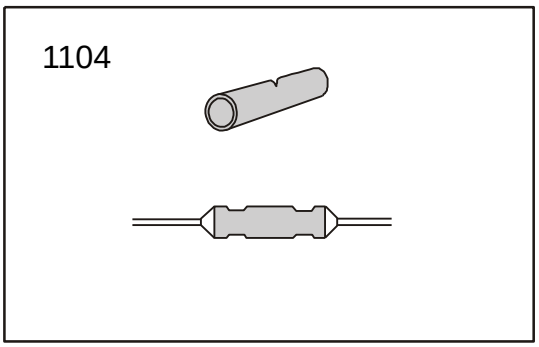
1103

Tin solder, coil
Tin solder (dia. 2 mm) with resinous flux



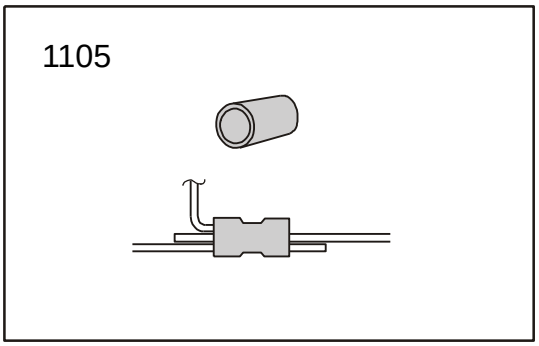
1104

Crimp connector for single wire (100 connectors)
Use a crimp connector with centre stop to connect 2 wires.



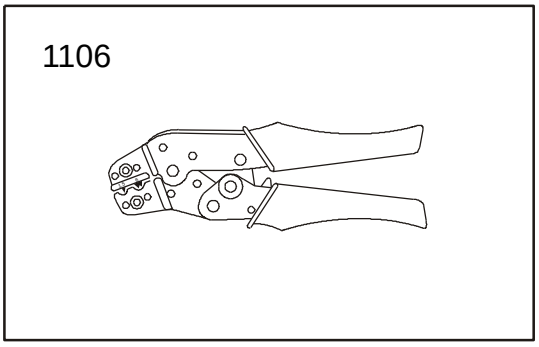
1105

Crimp connector for 3 wires (25 connectors)
Use a crimp connector with full passage for T-point connection.



1106

Crimping tool
Use the ratchet crimping tool, recommended for pressing the crimp connectors.



1107

Installation wire (tinned, 25 m)
Carry out common wire extension at bends and branches with installation wire, dia. 1,39 mm (tinned).

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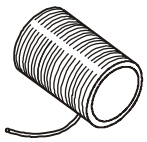
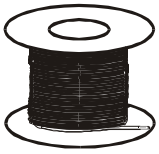
1107



1108

Installation wire (insulated, 100 m)
Especially at branches, insulated installation wire may be used.

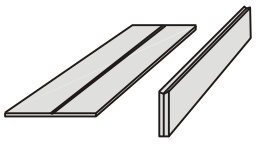
1108



1112

Felt (2 pcs.)
Hygroscopic felt to pack the tinned alarm wire is delivered in parcels of 2, corresponding to 2 normal joints.

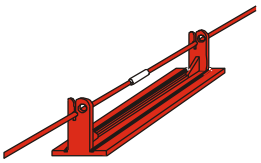
1112



1113

Wire holders (50 pcs.)
Install the blank copper wire in wire holders, 3 per normal joint.

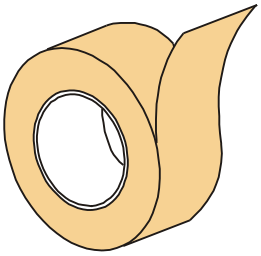
1113



1114

Coil of crepe tape (50 m)
Fix felt and wire holders to the service pipe with crepe tape. Do not use other types (e. g. PVC).

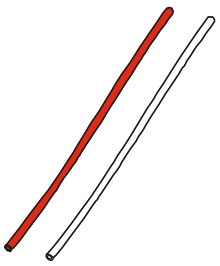
1114



1115

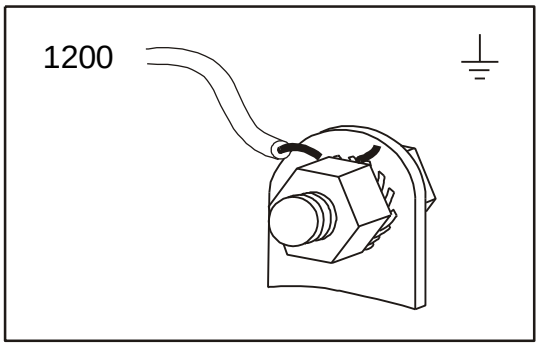
Flex (50 pcs.)
Use insulating sleeves to insulate the surveillance wires at for example, terminations, connections, branches and the like.
Available in bags of 50. (25 red and 25 white).

1115



1200

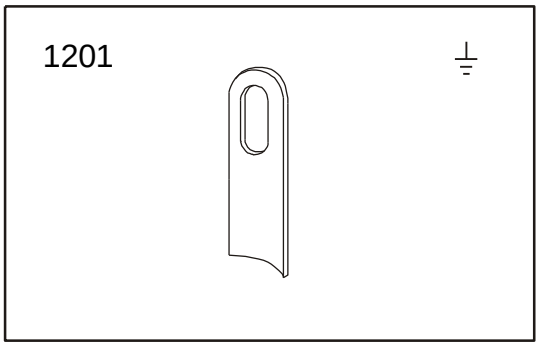
Earth connections, short
Weld earth connections on the service pipe where coupling boxes, cable connections and jumper cables must be installed. Short earth connections (10 + 5 sets of bolts in a bag) are primarily used inside the muff coupling.



1201

Earth connections, long

Weld earth connections on the service pipe where coupling boxes, cable connections and jumper cables must be installed. Long earth connections (10 in a bag) are used where the coupling boxes must be accessible.

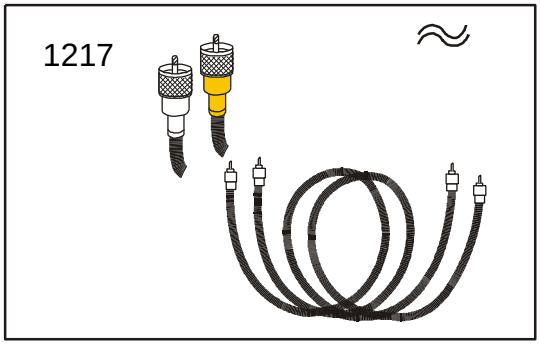


1217

Connecting cable

Cable for coupling and extension cables are supplied in bags of 2, 1 with yellow and 1 with white marking.
Supplied in different lengths.

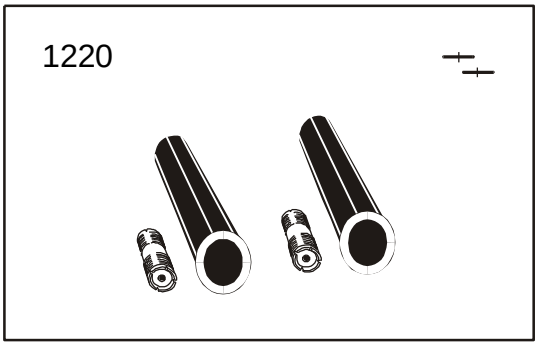
Picture – Example item no. 1217



1220

Connecting links

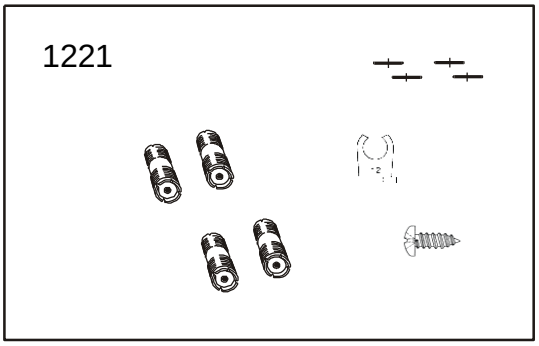
Connect the coaxial cables by means of connecting links.
For joints in the ground they are delivered with shrink tubing (2 sets).



1221

Cable installation set

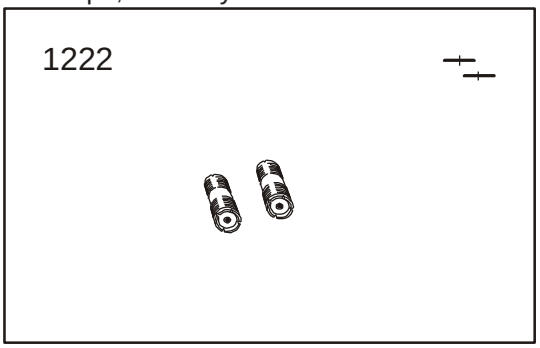
For connection of cables in a cabinet, 4 connecting links with matching cable holders and screws are used.



1222

Connecting links

Connect the coaxial cables by means of connecting links.
For joints in the ground use connecting link, PVC-tape, and butyl sheet.



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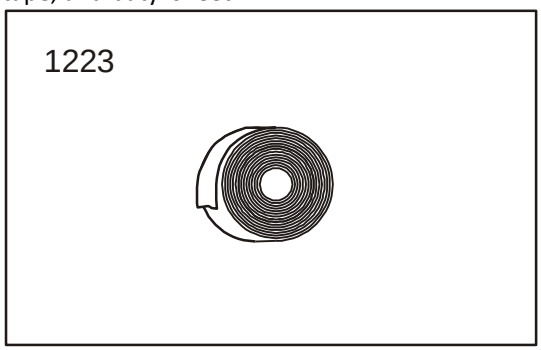
1223

PVC-tape

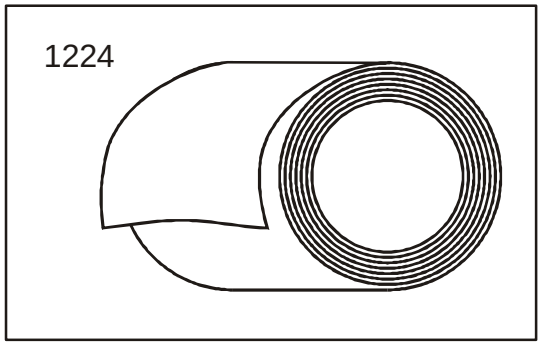
Connect the coaxial cables by means of connecting links.
For joints in the ground use connecting link, PVC-tape, and butyl sheet.



1224

Butyl sheet

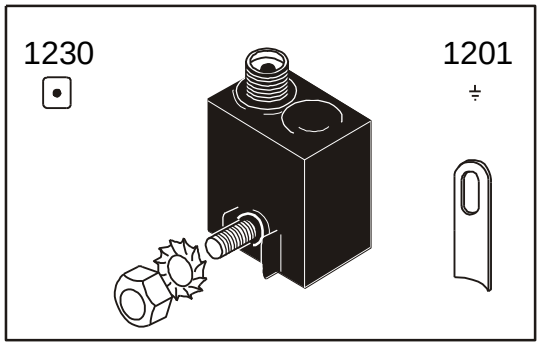
Connect the coaxial cables by means of connecting links.
For joints in the ground use connecting link, PVC-tape, and butyl sheet.



1230

Coupling box for single cable

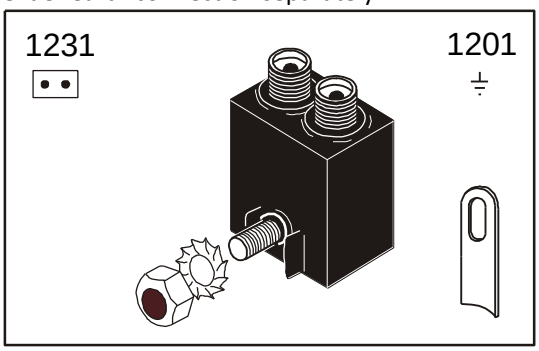
Use a coupling box with one coaxial connection to connect the fault locator or detector, when this is carried out at the pipe end in boiler rooms, cellars or dry wells (2 in bag).
Order earth connection separately



1231

Coupling box for double cable (jumper cable)

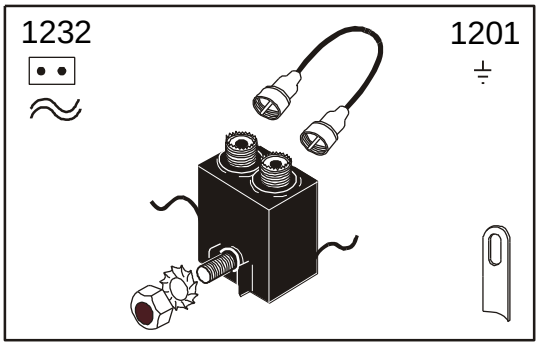
Use coupling box with two coaxial connections to connect between pipes in boiler rooms, cellars or dry wells (2 in bag).
Order earth connection separately.



1232

Coupling box for two single cables

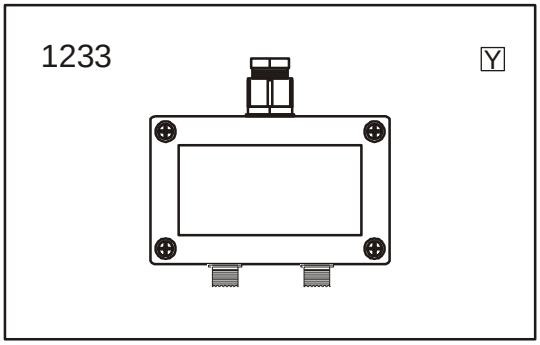
A double connection box is intended as a reference point on single pipes in detector or reference point systems but may also be used as connection of 2 circuits from a detector or fault locator (2 in bag).
Order earth connection separately



1233

Y-box

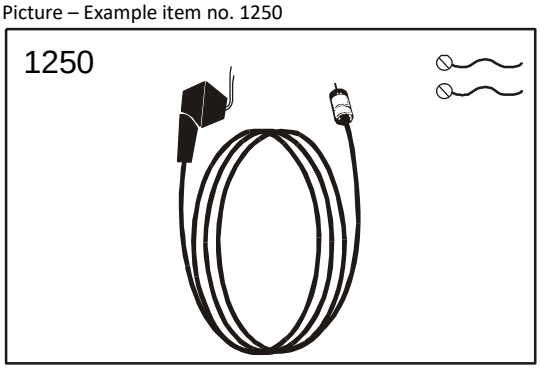
Use Y-box in 2020/8000 detector systems when connecting installation cable and coaxial cable.



1250

Single cable connection for plastic muffs
Use single cable connection between fault locator or detector and the muff in the ground.
Each bag contains 2.
Supplied in different lengths.

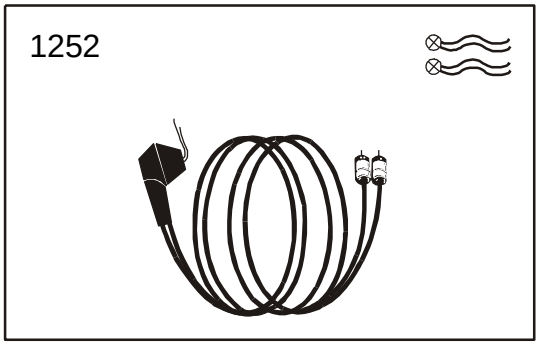
Picture – Example item no. 1250



1252

Double cable connection for plastic muffs
Use double cable connection between the muff in the ground and termination/check point in cabinet or building.
Each bag contains 2 cables.
Supplied in different lengths.

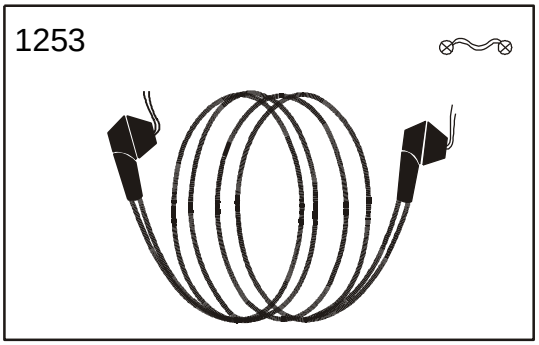
Picture – Example item no. 1252



1253

Jumper cable for plastic muffs – Open mirrow.
(Also available for closed mirror)
Use jumper cable between two muffs in the ground.
Each bag contains 1.
Supplied in different lengths.

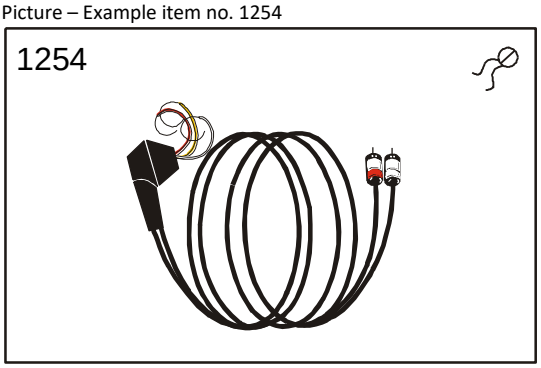
Picture – Example item no. 1253



1254
Twin cable connection for plastic muffs – Open mirror.
(Also available for closed mirror)

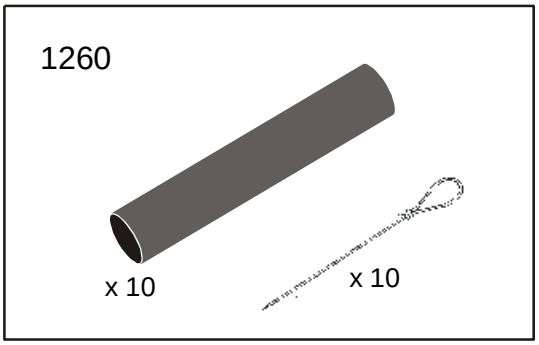
Twin cable connection is used as 1250, but can connect 2 measuring circuits at the same time.
Each bag contains 1.
Supplied in different lengths.

Picture – Example item no. 1254



1260

Cable end protector
Protect open ends of coaxial cables against dirt and moisture during installation.



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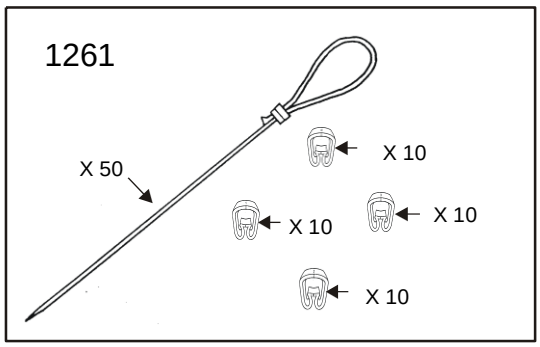
1261

Cable marking

Use cable-marking rings with the figures 1,2,3 and 4 for identification of cables



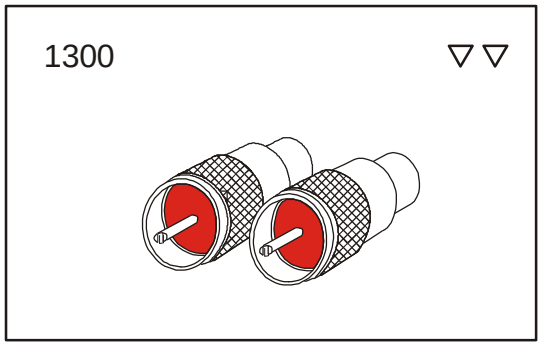
1300

End component (red)

For the detectors 2000 and 3000.

Use an end component when the detector circuit is terminated in a building or the like. (Installed on a 1230)

Is available in sets of 2.



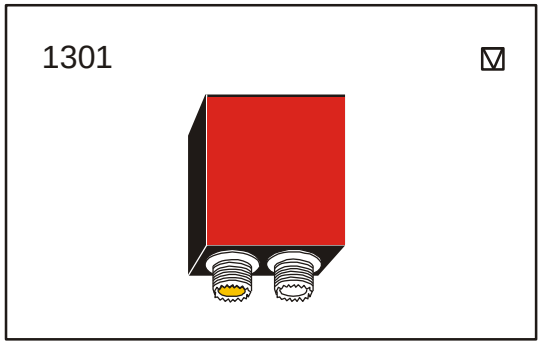
1301

Adaptor box (red)

For the detectors 2000 and 3000.

Use an adaptor box when a detector's circuit is terminated by means of cable connection in ground.

Delivered 1 at a time

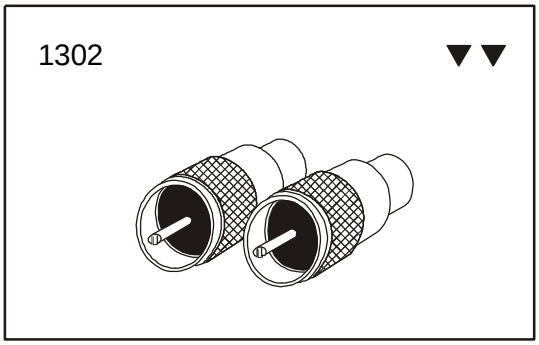


1302

End component (black)

Use an end component when a fault locator circuit is terminated in a building or the like. (Is installed on a 1230).

Is available in sets of 2.

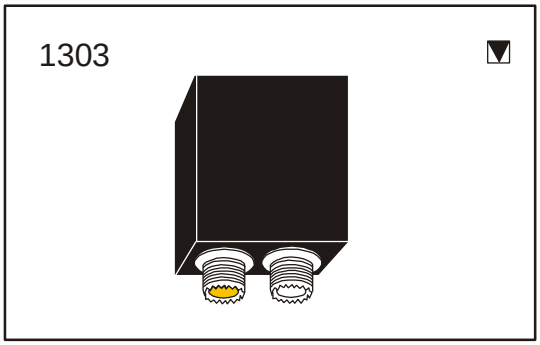


1303

Adaptor box (black)

Use an adaptor box when the fault locator circuit is terminated by means of cable connection in the ground.

Delivered 1 at a time.

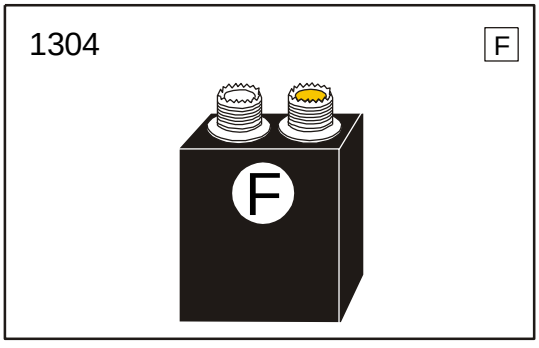


1304

Fault simulator

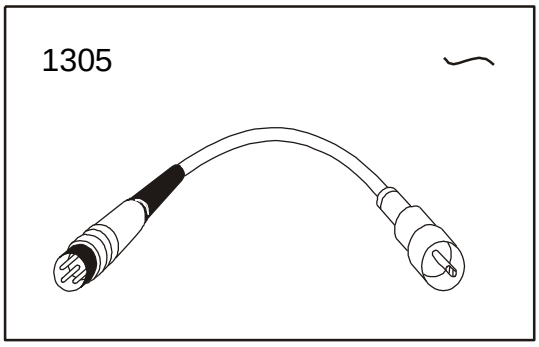
Use a fault simulator when cable connections are made in order to determine the distance to reference points.

Delivered 1 at a time



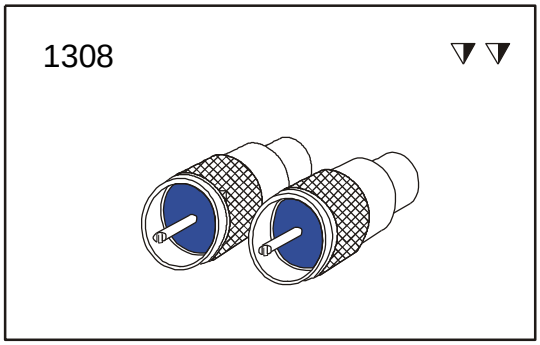
1305

Connecting link for relay
When the relay of the fault locator is used, a connecting link is inserted between the DIN-outlet and the coaxial cable.
Delivered 1 at a time.
Also applicable for detectors.

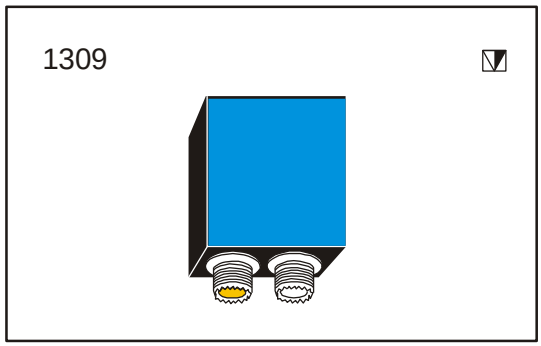


1308

End component (blue)
For the detectors 2020, 8000 and 8002
Use an end component when the detector circuit is terminated in a building or the like. (Installed on a 1230).
Is available in sets of 2.

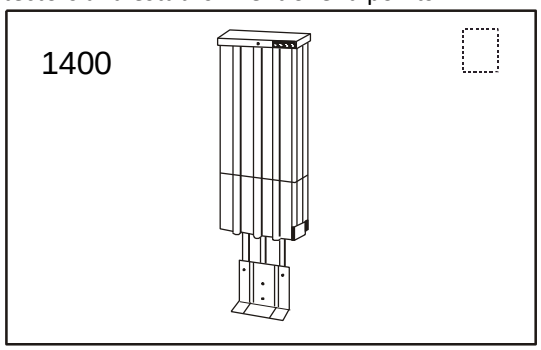


1309
Adaptor box (blue)
For the detectors 2020, 8000 and 8002.
Use an adaptor box when a detector's circuit is terminated by means of cable connection in ground.
Delivered 1 at a time.



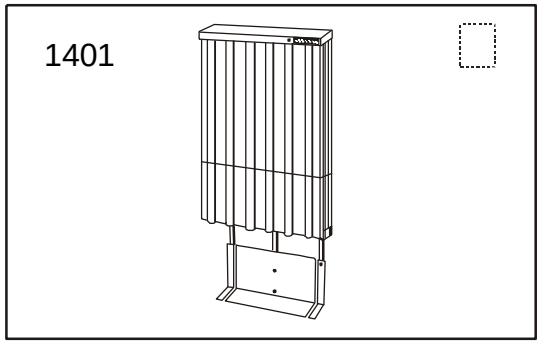
1400

Cabinet for component installation, narrow
Lockable cabinet for installation of components and surveillance equipment.
It is made of fibreglass with a sliding foot made of steel for installation in the soil or in concrete. The narrow cabinet is recommended for 1-circuit detectors and establishment of end points.



1401

Cabinet for component installation, wide
Lockable cabinet for installation of components and surveillance equipment.
It is made of fibreglass with a sliding foot made of steel for installation in the soil or in concrete. The wide cabinet is recommended for installation of fault locator, 4-circuit detector and reference points.



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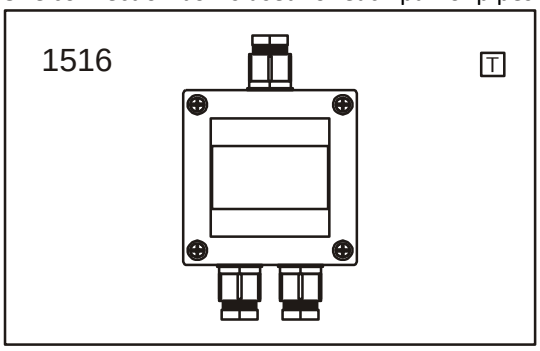
1516

Connection box

Used for connecting the measuring wires in a pair of pipes to an installation cable from a detector 2020/8000. The cabinet contains two diodes, which respectively block and open the measuring signal. The cabinet also contains a voltage transient protector.

One connection box is used for each pair of pipes.

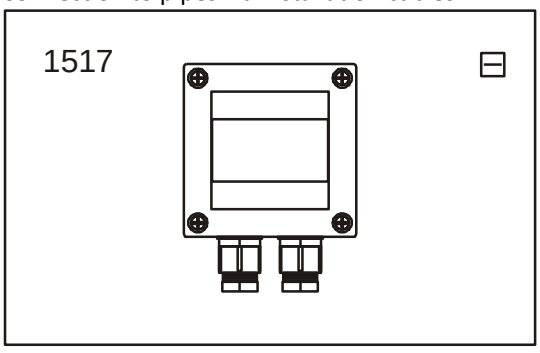


1517

Terminal box

Used for establishing easily accessible measuring points for control measuring and fault-location. The wire length between two measuring points should not exceed 800 m.

Connection to pipes via installation cables.



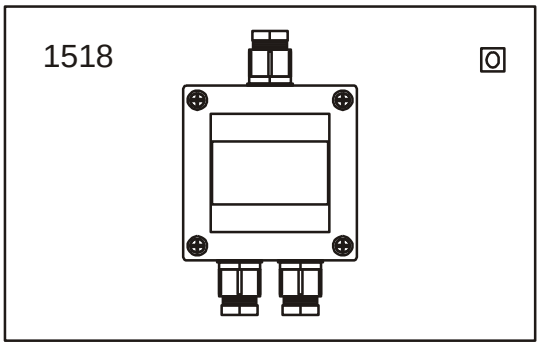
1518

Extension cable box

Is used for connecting the measuring wires in one pair of pipes to an installation cable.

Installation cables are used in the house to couple from one pair of pipes to another.

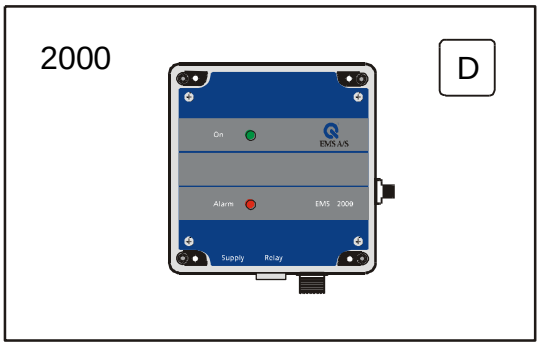
One extension cable box is used for each pair of pipe.



2000

1 circuit detector

A 1-circuit detector can monitor a pipeline up to 1000 m by means of the embedded wires in the pipe system. Registers open wire or moisture with red lamp. Green lamp means fault free. Is connected to 230 V. Can be connected to a central surveillance system by means of a potential free relay.

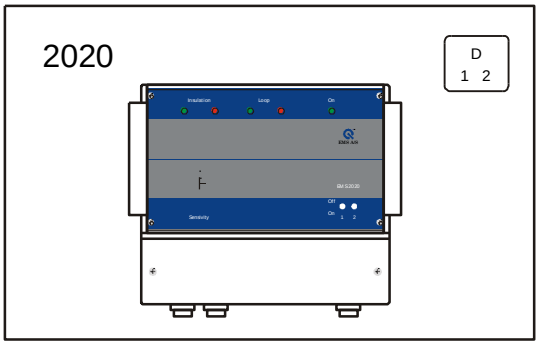


2020

2-circuit detector

A 2-circuit detector can monitor up to 2 x 7000 m of pipeline by means of the embedded wires in the pipes. Registers open wire or moisture with red lamp. Green lamp means fault free. Indicates that the fault is a disconnection or moist/short circuit fault.

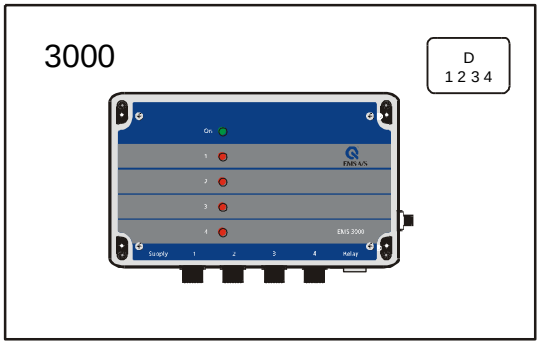
Is connected to 230 V. Can be connected to a central surveillance system by means of a potential free relay.



3000

4-circuit detector

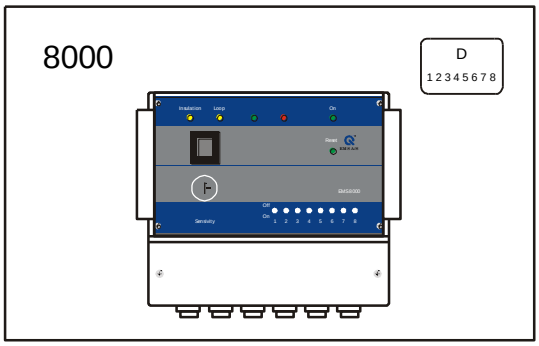
A 4-circuit detector can monitor a pipeline up to 4 x1000 m by means of the embedded wires in the pipes. Registers open wire or moisture with red lamp on the circuit in question. Green lamp means fault free.
Is connected to 230 V.
Can be connected to a central surveillance system by means of a potential free relay.



8000

8-circuit detector

An 8-circuit detector can monitor up to 8 x 7000 m of pipeline by means of the embedded wires in the pipes. Registers open wire or moisture with red lamp. Green lamp means fault free. Indicates that the fault is a disconnection or moist/short circuit fault.
Is connected to 230 V.
Can be connected to a central surveillance system by means of a potential free relay.



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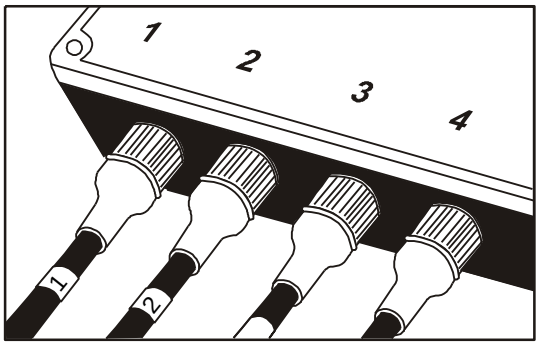
General

Detector

Description

Connecting detector and cables

Install the detectors directly on a wall in a building or in a cabinet and connect them to 230 V AC. Use coaxial connections on the bottom of the detectors when connecting the detectors to the pipe system.
Warning! Never measure with the control instrument, nor electrically weld or connect other measuring instruments to a pipe system connected to a detector.
Always number the cables in correspondence with the 4 connections.



Relay Connection

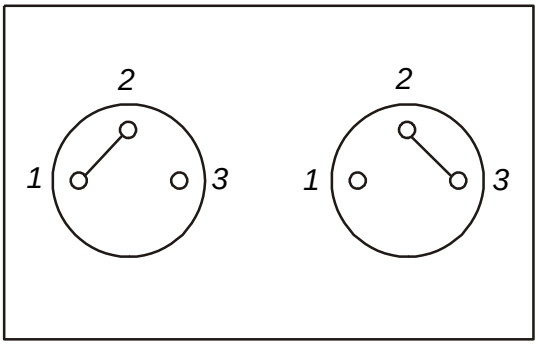
Description

The detector or fault locator is supplied with a relay that is used for central surveillance.
Connect by means of 3-pole DIN connector on the bottom of the detector or fault locator.
Relay contacts: close or open
Contact load:
- Max. 3 W
- Max. 100 V
- Max. 0.25 A

Normal connection:
- Connection between contacts 1 and 2 of the relay contact.

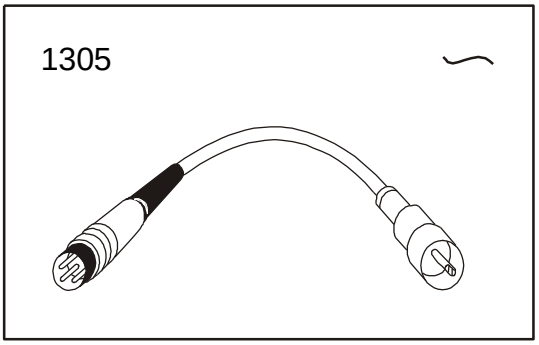
Connection in the case of a fault:
- Connection between contacts 2 and 3.

This can be seen in the illustration.



Connecting link for relay

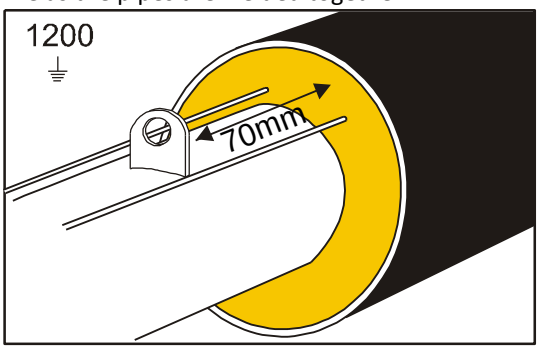
Insert connecting link for relay, part no. 1305, when the relay of the fault locator is used.
The adapter fits coaxial connections.



Earth connection

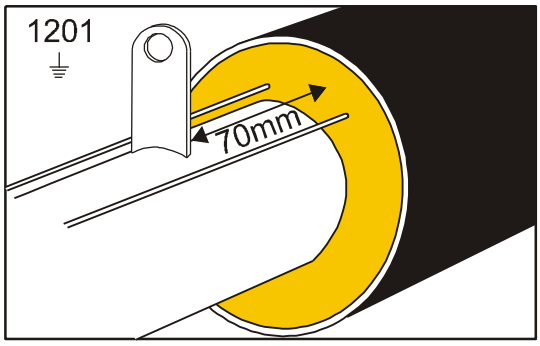
Earth connection/cables

Where the wiring for some reason exits the pipe system short earth connections (1200) are welded on to the steel pipe, so the measuring references of the steel pipe are correct.
The alarm drawing shows where to weld the earth connection onto the steel pipe. Do it at the same time as the pipes are welded together.



Earth connection/coupling boxes

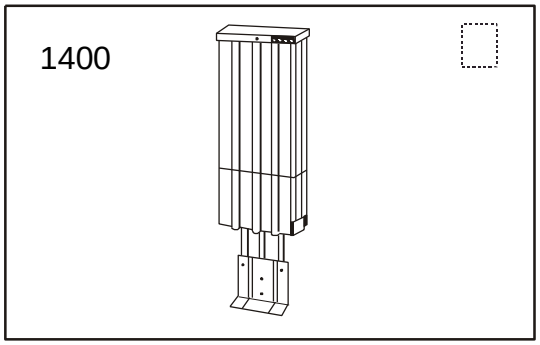
In buildings and inspection chambers where coupling boxes are installed it is recommended to use a long earth connection (1201), so the coupling boxes are not hidden by the inside insulation.
Weld the earth connection on to the pipe 70 mm from the foam end.
The alarm drawing shows where to weld the earth connection on to the steel pipe. Do it at the same time as the pipes are welded together.
Note! When an end-cap must also be installed it is necessary to install it before welding the earth connection on.

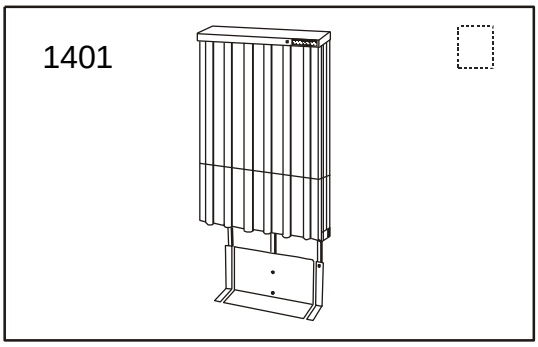


Cable cabinets

Description

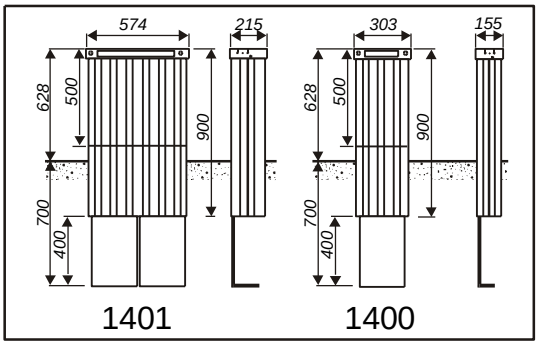
If components cannot be placed in a building or the like, install them in a cabinet.
Part no. 1400 (628 x 303 x 155 mm)
Part no. 1401 (628 x 574 x 215 mm).
The cable cabinet is constructed for individual installation or as a uniform system built together.
The single cabinets are connected by means of corrugated nails and a coupling mounting.



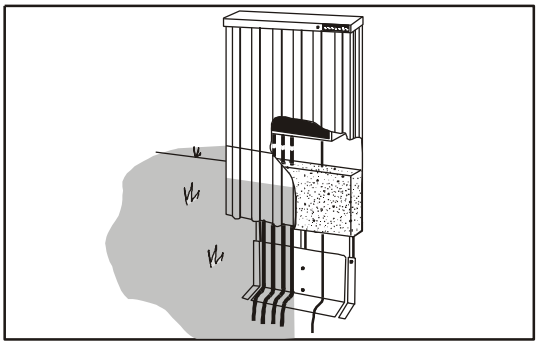


Installing cable cabinets

Adjust the sole plate according to the ground or the depth of the cable trench.
Place the cabinet with marking on cabinet in ground.



To avoid moisture ingress fill the lower third of the cabinet with styropor balls.
Seal the balls with sealing wax, if necessary.



Wiring

General

Preparations

The two copper wires, embedded in the insulation, are delivered with protection against damage by winding and installing them in the two countersink holes of the insulation.

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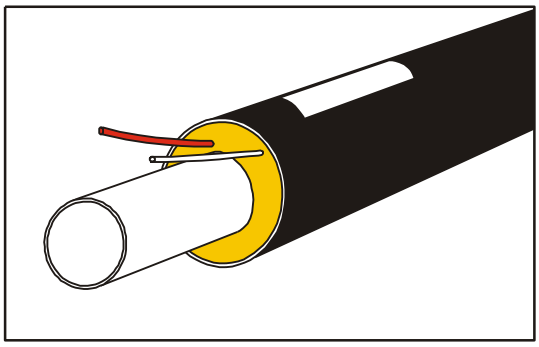
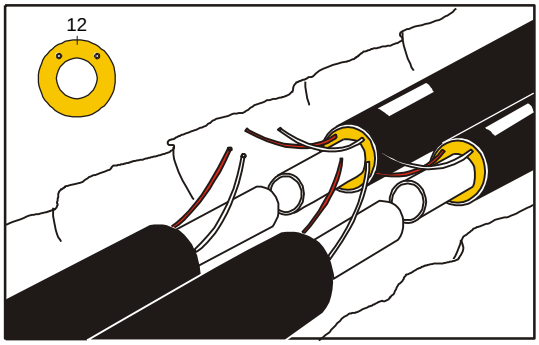
When installing the pipes in the trench follow the specifications of the wire position in the alarm drawing.
Place the pipes so the wires face upwards (10-to-2-o'clock position), and so the tinned wires and the copper wires are installed in pairs opposite each other.



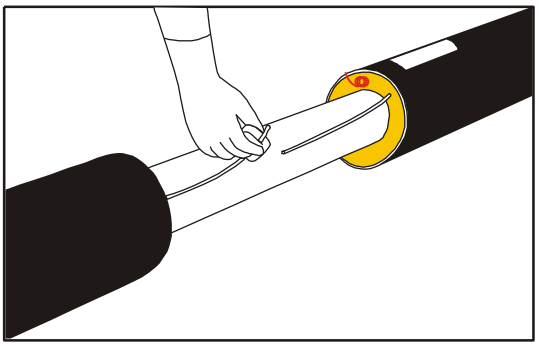
At each joint there must only be one pipe label and it must face upward (12 o'clock position)
In the surveillance system the alarm wires are placed at the top of the pipe in order to achieve:

- optimum installation conditions
- permanent accessibility of the wires when establishing branches.



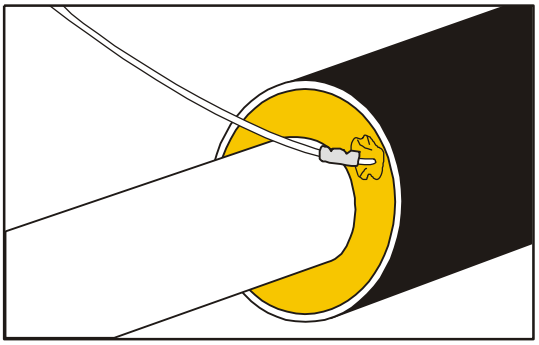
Straightening

Wind the coiled wires from the countersink holes in the insulation when the pipes have been welded together. Remove dirt and moisture from the insulation of the pipe ends.
Straighten the wires and clean the ends with steel wool or a cloth of synthetic textile (part no. 1101).



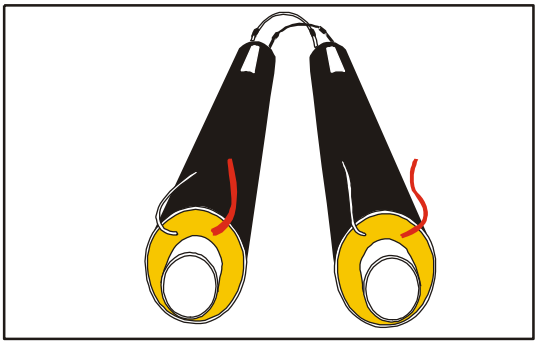
Repairing wires

Examine the wires for possible damage. If a wire has been damaged, for example, during removal of the insulation, remove the insulation around the wire end and solder a new piece of wire on as described in the following.
Note! Do not use a gas flame when soldering towards the insulation.



Preparations for checking the joint

When beginning the wire installation, connect the wires in the two pipes as shown in the illustration. Tinned wire to tinned wire and copper wire to copper wire.
In this way 2 measuring circuits are established which must be used to check the wire connections on the subsequent joints.



Adjusting the control instrument

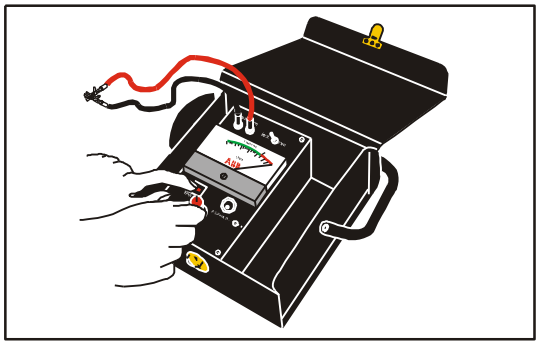
Carry out 2 kinds of tests:

1. Check that there is good electrical connection through the connected wires.
2. Check that the wires have been correctly isolated from the steel pipe (15 mm).

These checks are carried out at each joint with a special measuring instrument, a "megger".
Before these tests adjust the instrument as follows:

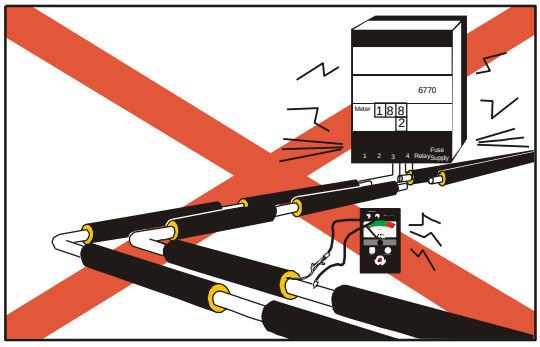
- Insert the measuring wires and short-circuit them
- Place the switch in measuring range 2 "ISOL"
- Press the test knob and the indicator deflects
- Adjust the indicator to maximum deflection by means of the adjusting knob
- The instrument is now ready for use

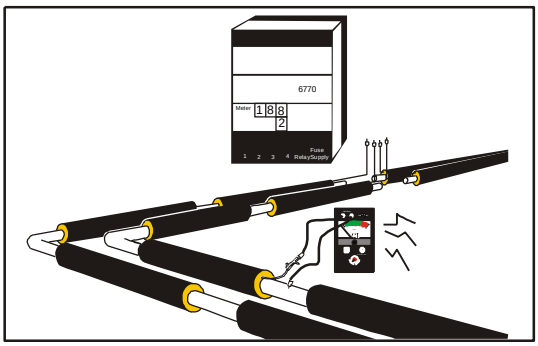
Note! If the instrument cannot be adjusted to maximum deflection, it must be recharged using the supplied charger that is connected to a 230 V AC supply and the 6 V DC terminal of the megger.



Warning

Never use the megger with connected fault locators as the voltage emitted by the megger may damage the exits of the fault locator.

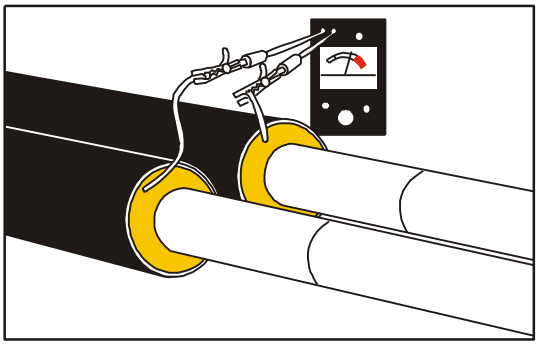




Test 1, resistance

- Connect the instrument wires to the cleaned tinned wires (alarm)
- Place the switch in measuring range 1 "ohm"
- Press the test knob
- The indicator deflects into the green part of the dial.
- At the beginning of the installation the deflection is insignificant, but it increases as more metres of wire are connected (resistance measurement: Approx. 11 ohm at 1000 m. 1.5 mm^2 wire).
- If the indicator enters the red part of the dial, a poor wire connection has been made in the previous joint.
- Check this joint and repair it.
- Repeat the test.

Check both measuring circuits in the pipes in this way.



Test 2, insulation

- Connect one instrument wire to one of the wires in a pipe.
- Hold the other instrument wire against the steel pipe in the same pipe. Check that there is good electrical connection. Use the weld.

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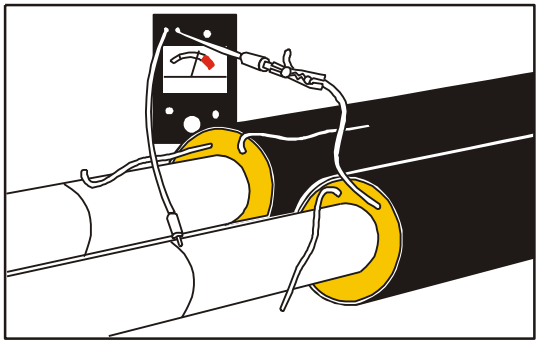
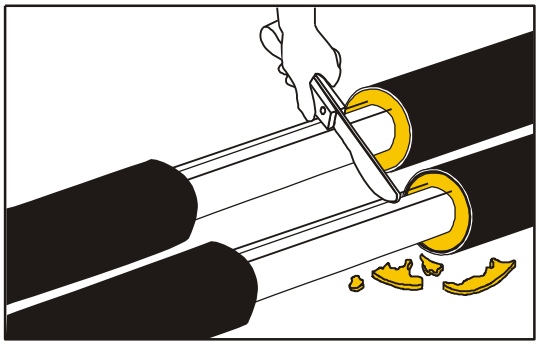
- Place the switch in measuring range 2 "ISOL".
- Press the test knob.

The deflection of the indicator must be minimal and in the green part of the dial.



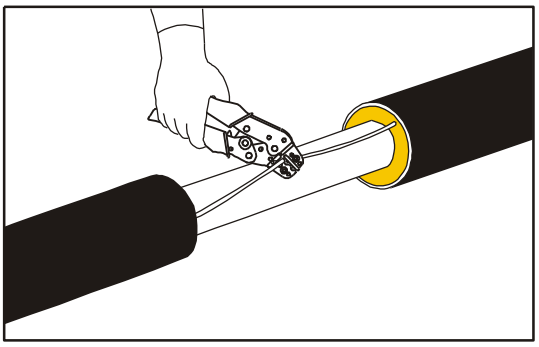
- If the indicator deflects into the red part of the dial, an incorrect installation (moisture) has been made in the previous joint.
- Check the joint.
- Remove possible moist foam
- Repeat the test.
- Check all the wires in the joints in this way.
- Now move the instrument to the next pipe joint.



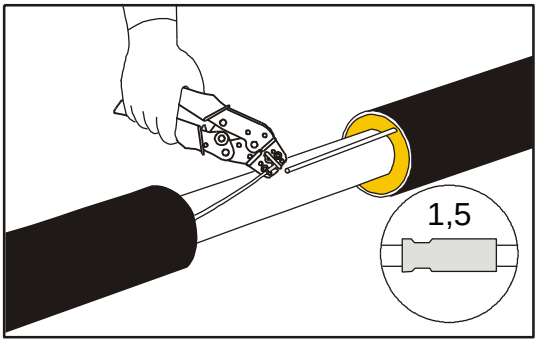
Wiring - straight joints

Connecting wires

Straighten the wires.
Cut the overlapping ends off and clean the wires.
Apply soldering paste to the ends.
Place a connector on one of the wires and crimp it with the crimping tool (jaw width 1.5 mm^2).

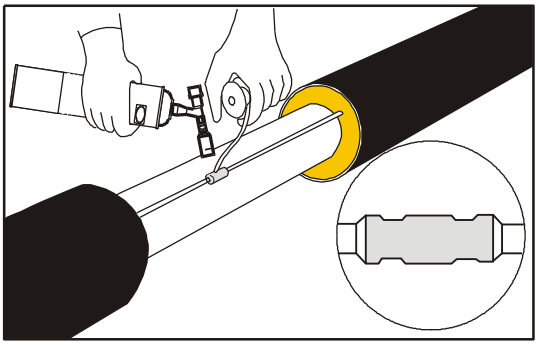


Insert the other wire into the connector and crimp it.
A good mechanical connection is now ensured.
Note! The wires must be tight, i.e. the same length as between the foam ends.



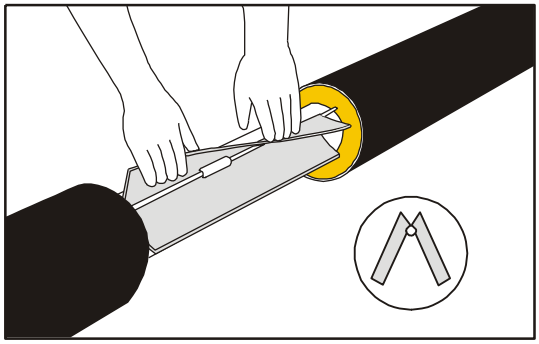
Soldering the wires

Heat the connector with the soldering iron. When its colour changes and becomes shiny the temperature is correct.
Add tin solder to both ends of the connector.
The soldering has been carried out correctly when the tin has been absorbed into the ends of the connector.
Now a good electrical connection has also been established.

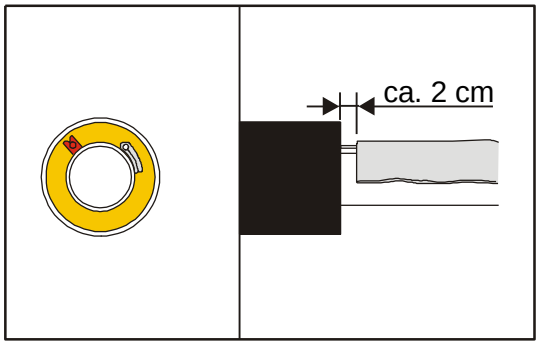


Installing felt and wire holders

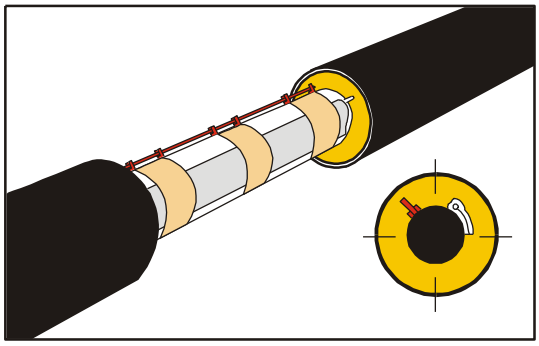
Place a piece of hygroscopic (absorbent) felt between the steel pipe and the tinned wire.
Check that both steel pipe and felt are dry prior to installation.
The felt must "hang" on the tinned wire



The installation is correct if there are a couple of cm between felt and insulation.

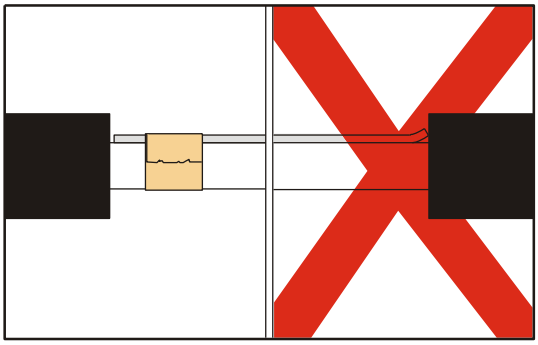


Install the copper wire (the auxiliary or signal wire) in 3 wire holders that ensure the correct distance to the steel pipe.
Fasten the wire holders and felt with 3 strips of crepe tape.



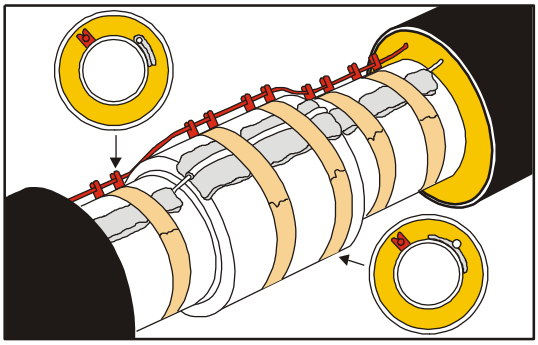
Place the tape so the felt is not pressed against the ends.
Repeat test 2 after having installed felt and wire holders.
Warning: Do not install the surveillance system in rainy weather without the necessary cover.

Replace wet felt immediately.
Insulate the muff the same day as the wires are installed at the latest.



E-muffs

Extend the wires with E-muffs.
Apply felt to the alarm wire and adjust the felt as follows:
Double felt on the steel pipe.
A single layer of felt on the E-muffs in order to ensure good insulation.
Apply a white covering flex to the wires that are placed on a single layer of felt.
Place the signal wire in a suitable number of wire holders.
Fasten it all with crepe tape.



Shortening pipes

When welding fitting pieces the tinned wires and copper wires must, of course, still be connected in pairs.
In large dimensions, for productional reasons, there may be 4 embedded wires (2 of each) of which only 2 are visible at the pipe ends.
Check with the megger which one to use.

One instrument wire is connected to the wire and the other to earth where there are 2 wires.
Place the switch in the measuring range "ISOL".
When the connected wire is short-circuited against earth where shortening has been carried out, the megger will deflect.

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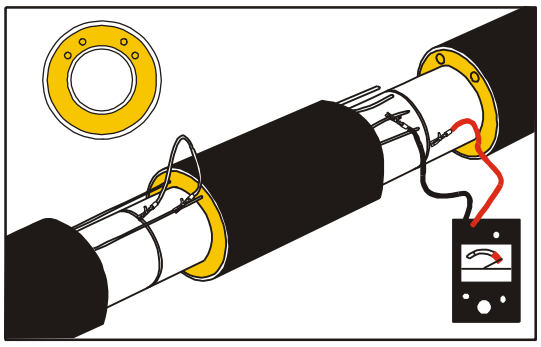
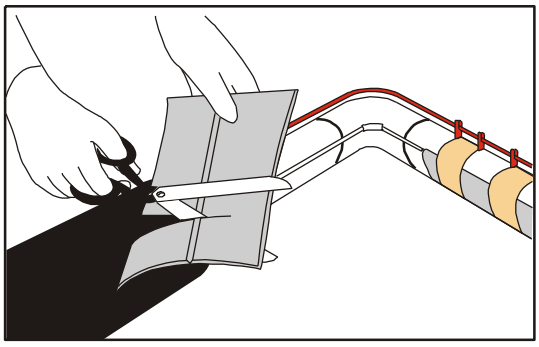


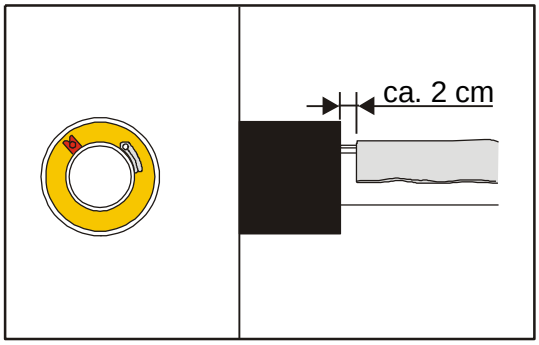
Wiring - bends

Installing felt and wire holders

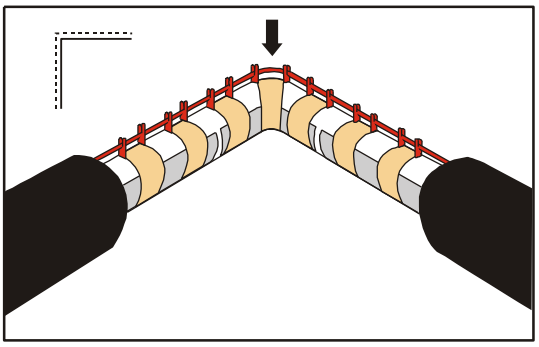
Extend and adjust the wires in order to ensure the correct distance to the steel pipe of 15 mm.
Apply felt that has been accurately adjusted to the alarm wire.
Push the felt pieces close together.
The connectors must be placed inside a piece of felt.



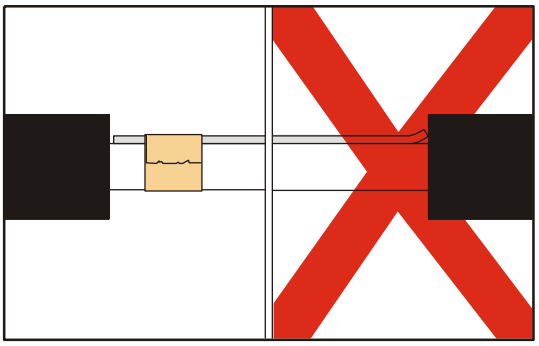
Check that both the steel pipe and the felt are dry during installation.
The felt must "hang" on the tinned wire.



Apply enough wire holders to the signal wire so that the wire cannot be pressed against the steel pipe.



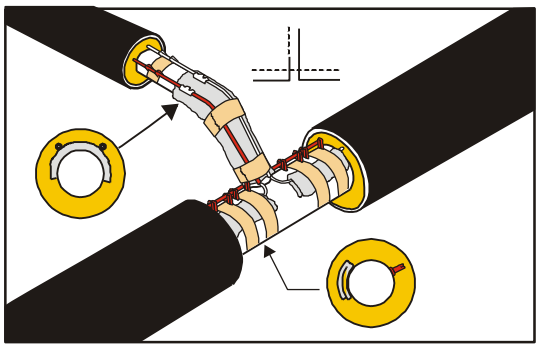
Place the tape so the felt is not pressed against the ends.
There must be tape around the joint on the felt pieces.



Wiring - branches

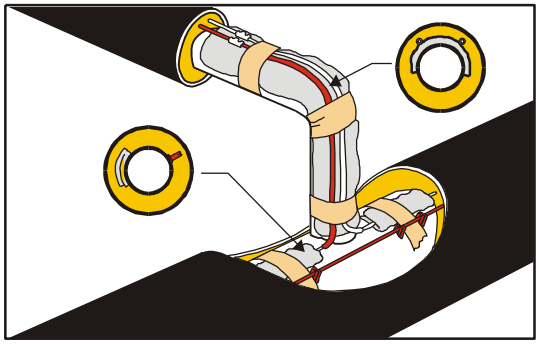
Steel muff branches

Adjust the wires at the branches, so they have the correct distance to the steel pipe of 15 mm everywhere - also on the branch pipe piece.
Use adjusted double felt on the main pipe and wire holders as usual.
Apply unfolded felt (single layer) to the connecting branch and provide the wires with a flex tube; white for the tinned wire and red for the copper wire. Fasten it all with crepe tape.
Place the tape so the felt does not press against the ends.
To extend the wire and replace the flex tube an insulated 1.5 mm^2 copper wire that is available in coils (part no. 1108) may be used.



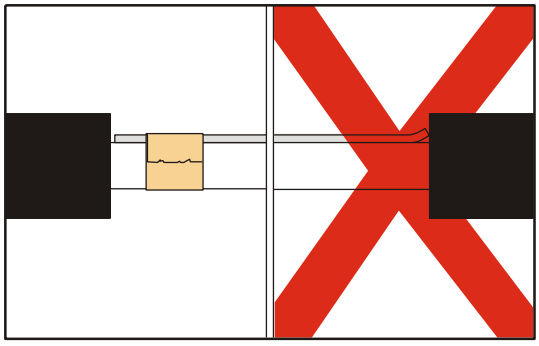
Branch saddles

Adjust the wires at the branches so they have the correct distance to the steel pipe of 15 mm everywhere - including the branch pipe piece.
Use adjusted double felt on the main pipe and wire holders as usual.
Apply unfolded felt (single layer) to the connecting branch and provide the wires with a flex tube; white for the tinned wire and red for the copper wire. Fasten it all with crepe tape.
Place the tape so the felt does not press against the ends.
To extend the wire and replace the flex tube an insulated 1.5 mm^2 copper wire that is available in coils (part no. 1108) may be used.



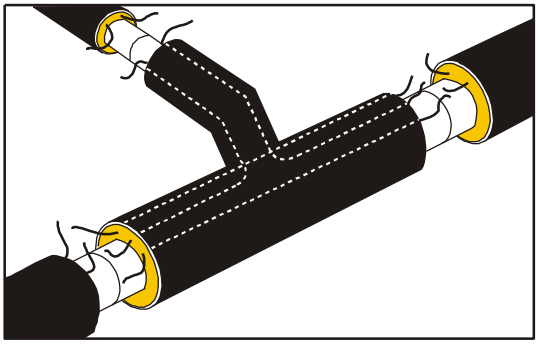
Felt position

Place the tape so the felt is not pressed against the ends.



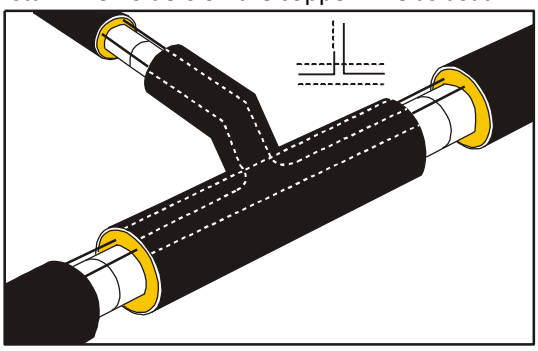
Pre-insulated branches

Pre-insulated branches are available with 3 embedded wires: 1 tinned and 2 copper wires.
Use the copper wire, which fits opposite the connected pipes. Cut the other one off.



Installation

Connect the wires in accordance with the drawing.
From the illustration it can be seen that the wires from the connected pipe are used. The 2 tinned wires from the pre-insulated branch are connected to the copper and tinned wires in the main pipe.
Install felt on the tinned wire.
Install wire holders on the copper wire as usual.



From the illustration it can be seen that the wires from the connected pipe are not used.
The 2 tinned wires from the pre-insulated branch are connected.
Install a felt piece on the wires so the distance to the steel pipe of 15 mm is correct.

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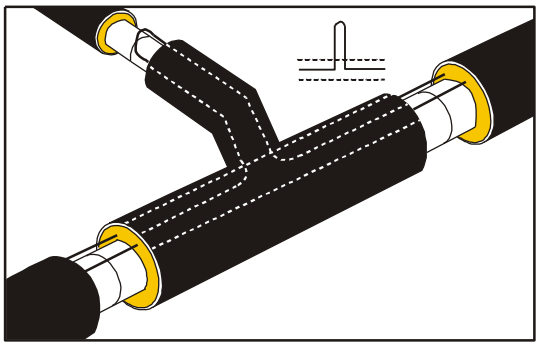
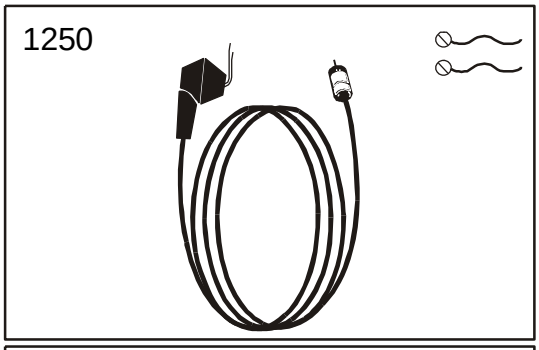


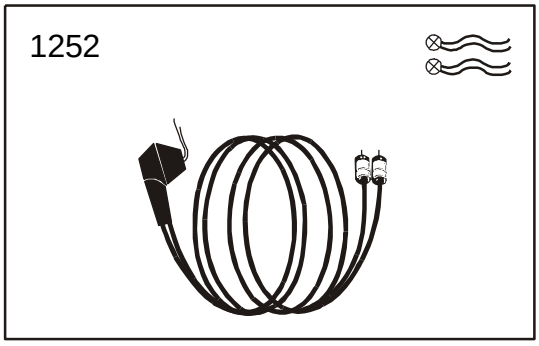
Cable installation

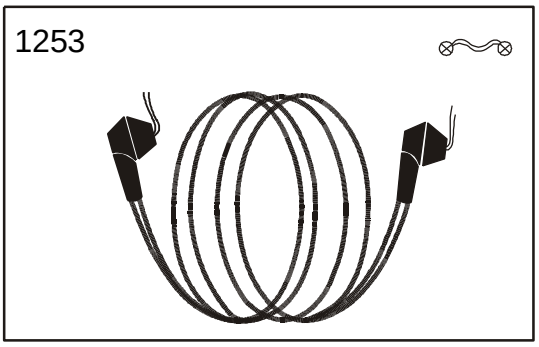
Installing connecting cables, band muffs

Overview

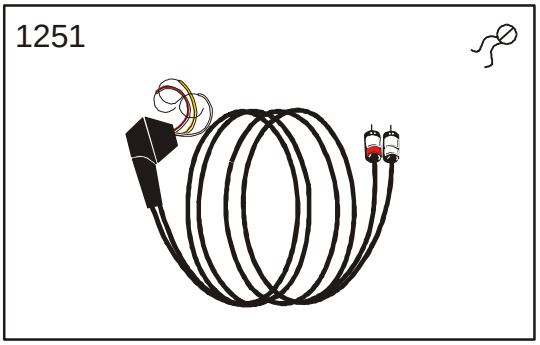
All cables for band muffs are delivered with the same cable foot to be welded into the outer casing. The cables are supplied with a white and yellow wire out of the cable foot. Connect the white (tinned) wire to the alarm wire and the yellow one to the earth connection.
The symbol on the alarm drawing shows which wire in the pipe to use.



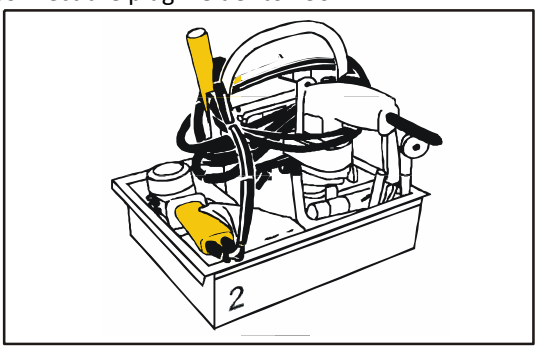




Twin cable
(Note: Two surveillance wires)

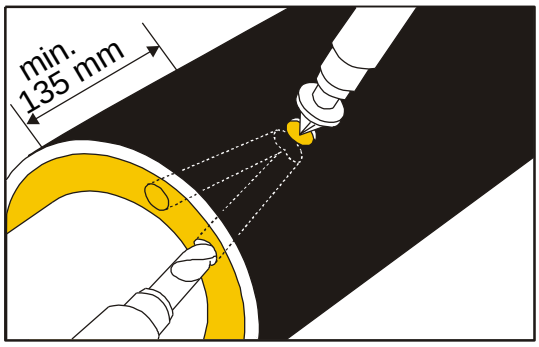


Use a plug welder to weld the cable into the outer casing.
Connect the plug welder to 230 V.

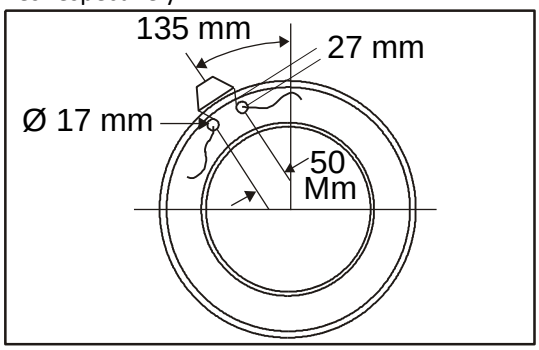


Preparations

Mark and drill a 43 mm conical hole 135 mm from the outer casing end.
Pay attention to the position of the wires so they are not damaged.

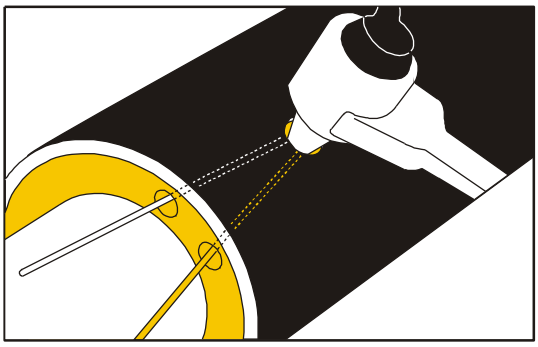


Drill 2 dia. 17 mm holes in to the conical hole.
Remove surplus foam and dirt before installing the cable.
NB: For twin cables, drill 3 holes with a distance of 50 mm for the earth connection and the two alarm lines respectively.



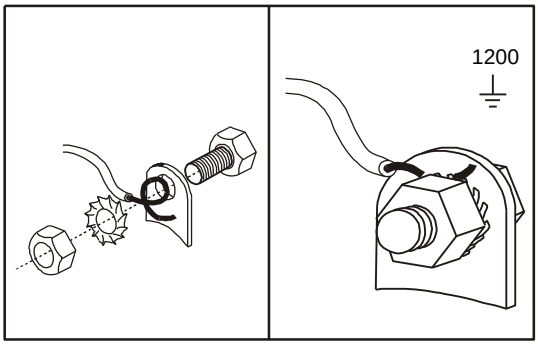
Welding in the cable foot

Pull the 2 wires from the cable foot through their holes towards the muff joint.
Connect the plug welder to 230 V and preheat it to 220°C which are adjustable on the thermostat.
Place the cable foot in the plug welder and preheat the plug before installing the plug welder in the outer casing.
When the lips of the HDPE-material have melted on the outer casing and cable foot, then pull the cable out of the plug welder and press the cable foot down into the melted material.
Keep the cable foot under pressure for approx. 1 minute, until the plastic has cured.



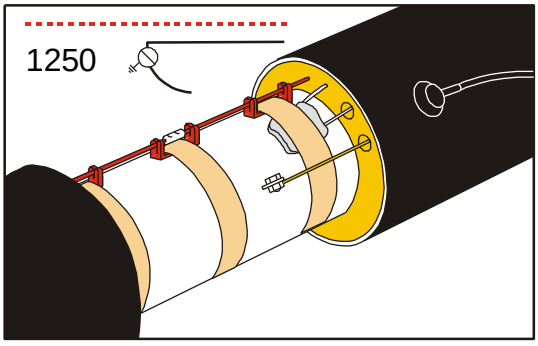
Earth connection in muffs

Connect the yellow wire from the cable foot to earth.
It is important to remove any rust on the earth connection and tighten the bolt properly.
When connecting cable in muffs always use short earth connection, part no. 1200 (10 connectors.).



Connection to alarm wire. Single and double cables

Connect the white wire from the cable foot to the wire in the pipe that is marked in the drawing as the symbol for the cable.
NOTE! The white wire from the cable must always have a distance to the steel pipe of 15 mm. Adjust, connect and solder the wire.
Use adjusted double felt up against the foam ends.



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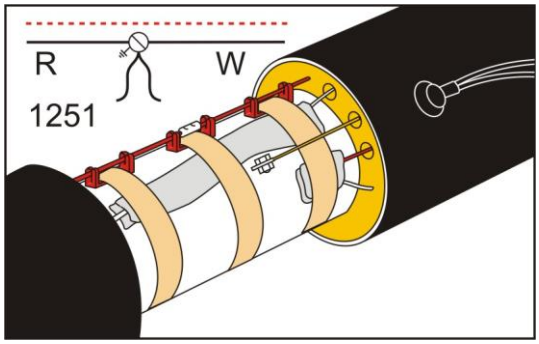
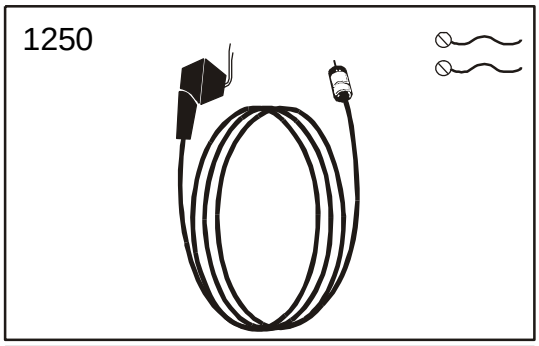
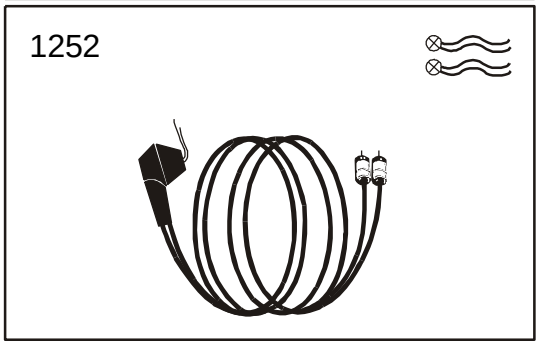


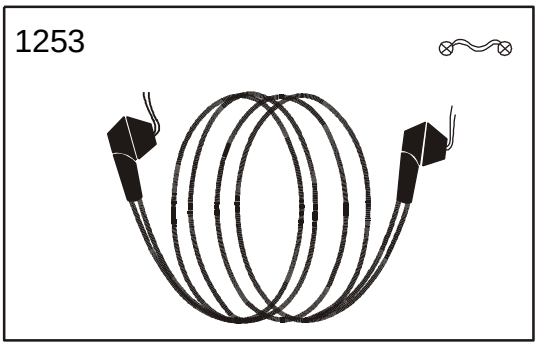
Installing - connecting cables, shrink muffs

Overview

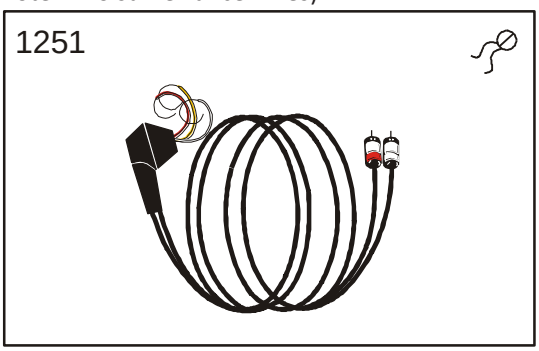
All cables for shrink muffs are delivered with the same cable foot.
The cables are supplied with a white and yellow wire out of the cable foot.
Connect the white (tinned) wire to the alarm wire and the yellow wire to the earth connection.
The symbol on the alarm drawing shows which one to use.



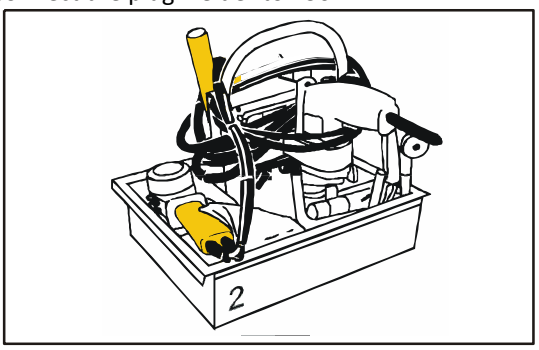




Twin cable
(Note: Two surveillance wires)

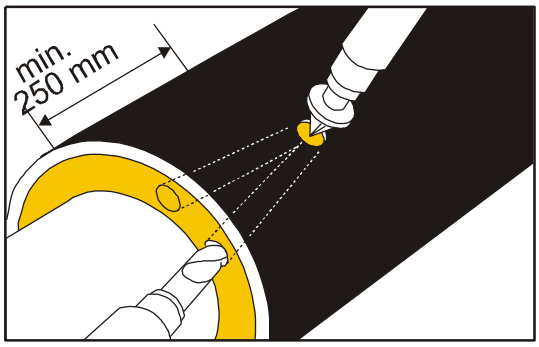


Use a plug welder to weld the cable into the outer casing.
Connect the plug welder to 230 V.

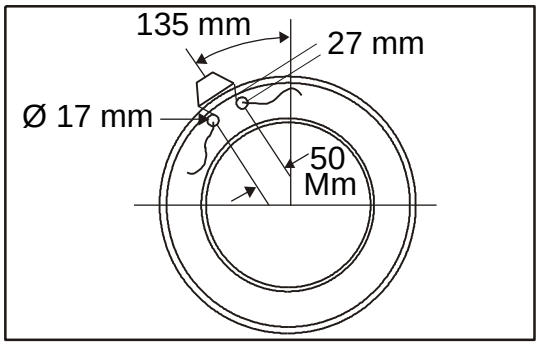


Preparations

Mark and drill a 43 mm conical hole 250 mm from the outer casing end.
Pay attention to the position of the wires so they are not damaged.

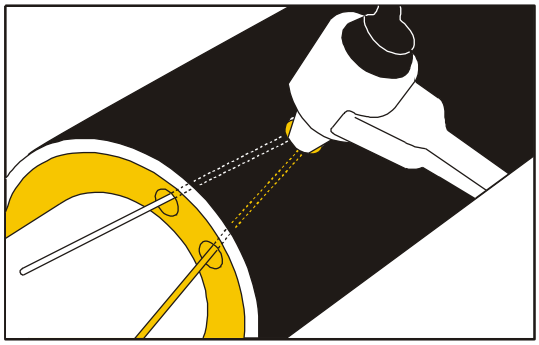


Drill 2 dia. 17 mm holes in to the conical hole from the foam end.
Remove surplus foam and dirt before installing the cable.



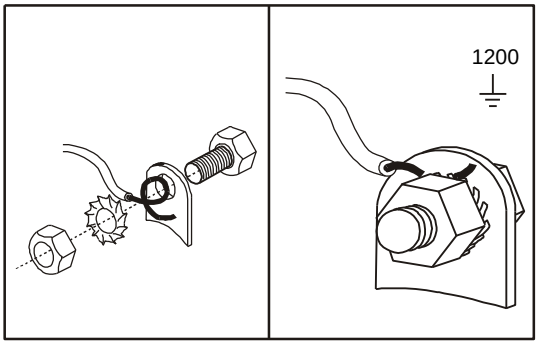
Welding

Pull the 2 wires from the cable foot through their holes towards the muff joint. Connect the plug welder to 230 V and preheat it to 220°C that are adjustable on the thermostat.
Place the cable foot in the plug welder and preheat the plug before installing the plug welder in the outer casing.
When the lips of the HDPE-material have melted on the outer casing and cable foot, then pull the cable out off the plug welder and press the cable foot down into the melted material.
Keep the cable foot under pressure for approx.1 minute, until the plastic has cured.



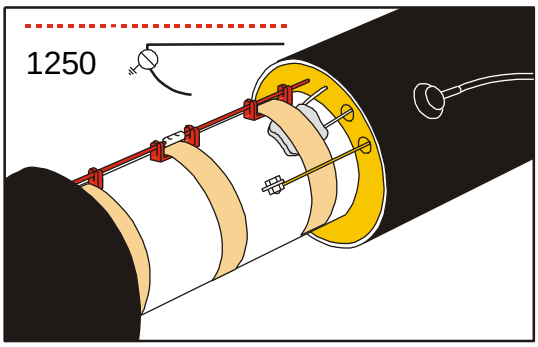
Earth connection in muffs

Connect the yellow wire from the cable foot to earth.
It is important to remove any rust on the earth connection and tighten the bolt properly.
When connecting cable in muffs always use short earth connection, part no. 1200
(10 connectors).



Connection to alarm wire

Connect the white wire from the cable foot to the wire in the pipe that is marked in the drawing as the symbol for the cable.
NOTE! The white wire from the cable must always have a distance to the steel pipe of 15 mm.
Adjust, connect and solder the wire.
Use adjusted double felt up against the foam ends.



Connection to alarm wire. Twin cables

Connect the white and red wire from the cable foot to the wire in the pipe, which in the drawing is marked with the symbol for the cable (e.g. R = red, W = white).
Likewise the two coaxial plugs are marked with red and white tape respectively.

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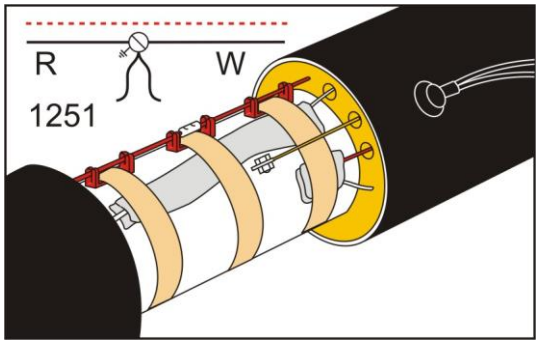
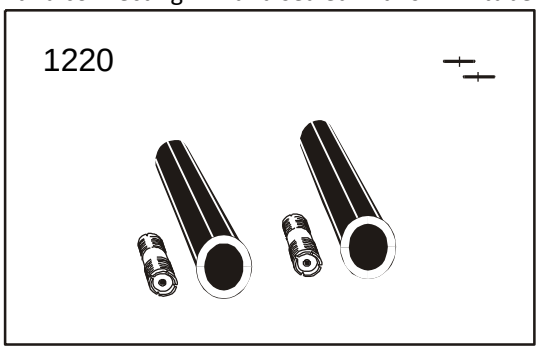


Installing cables and connecting links

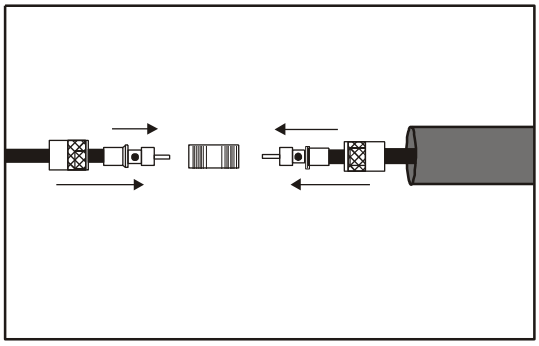
Overview

Cables to be extended in the earth are connected with a connecting link and sealed with shrink tube.

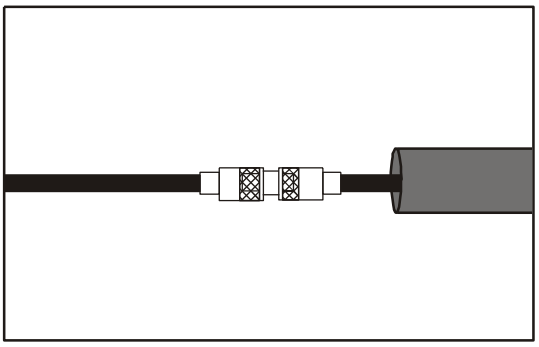


Connection

Mount the couplings of the cables on the connecting link with the shrink tube pulled over one cable. Note! The cable colours must correspond.

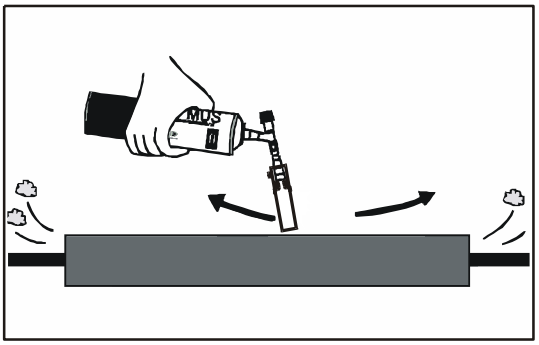


The connectors must be clean and tightened to achieve a good connection

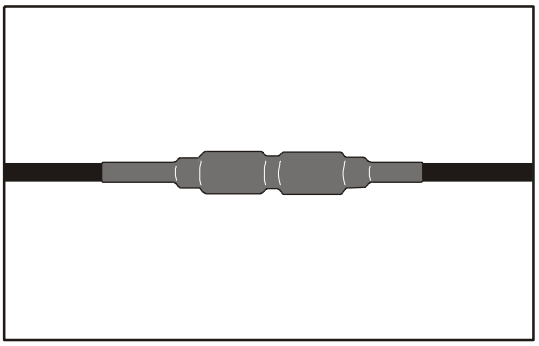


Shrinking

Shrink the shrink tube with hot air beginning from the middle and outwards to each side in order to make the air escape. Use soldering gas iron set, 1109/1110 with supplementary hot air tube.



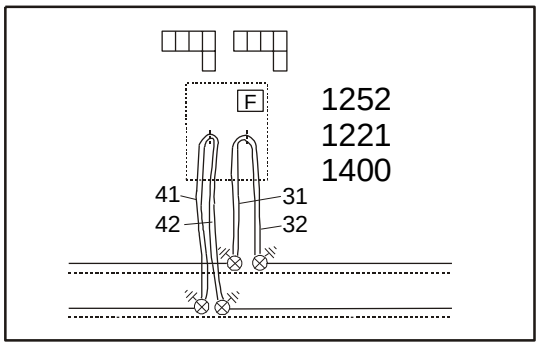
On the finished shrink tube, mastic must be visible at the ends.



Installing check point

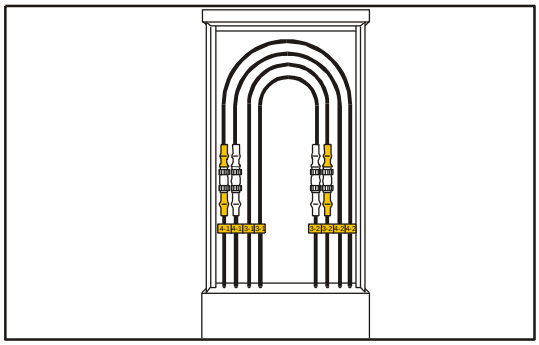
Establishing check point

Establish a checkpoint by joining together the cables in cabinets nos. 1400, 1401 or the like.
Use cable installation set, part no. 1221 including connecting links (4), cable holders and screws to join a double cable.
The illustration shows the symbol from the circuit diagram.



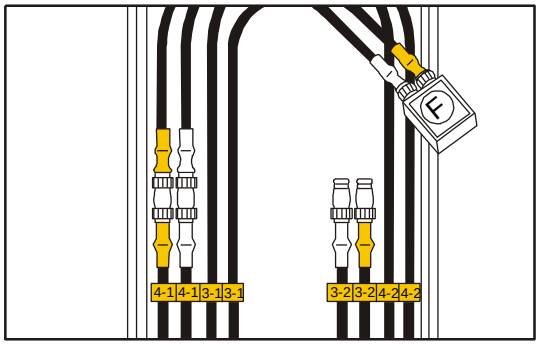
Installation

Install the cable holders on the back plate.
Connect the cables with a connecting link.
Note! Cable marking and colour marking must correspond.



Check point

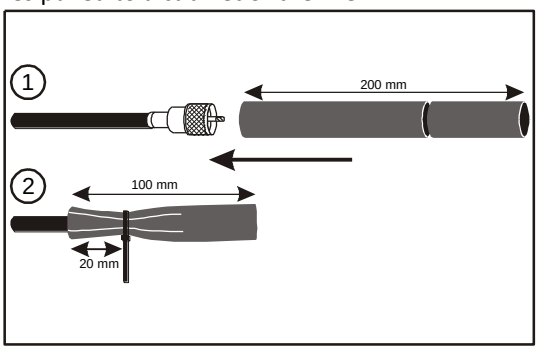
By opening the circuit and inserting a fault simulator, part no. 1304, a fault is simulated and the meterage is checked at the fault locator.
Compare this distance with the figure registered (and entered into the circuit diagram) after installation.
Note! The colour markings must correspond.



Marking and protecting cables

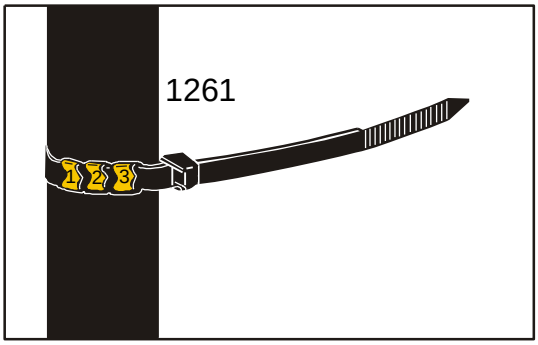
Cable protection

Protect the connector on the coaxial cables against moisture ingress.
Install cable end protectors, part no. 1260, on cables pulled to a cabinet or the like.



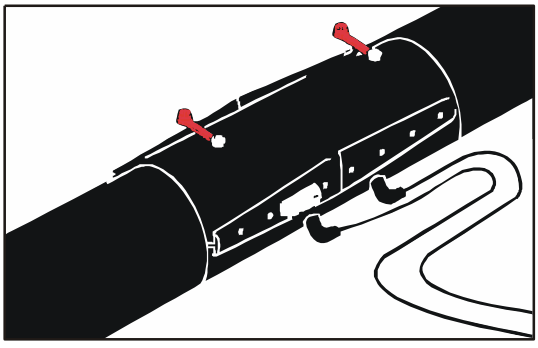
Cable marking

All cables pulled from the pipe system to a cabinet or the like must be marked.
Mark the cables systematically and enter the marking in the circuit diagram.



Relieving cables

The temperature difference in the pipe system will result in movements of the pipes.
Consequently, relieve the cables with a U-bend before pulling them to the cabinet.



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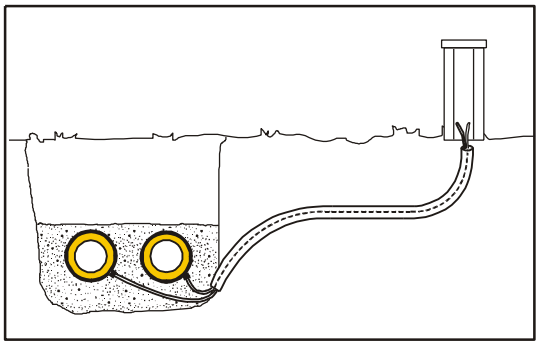
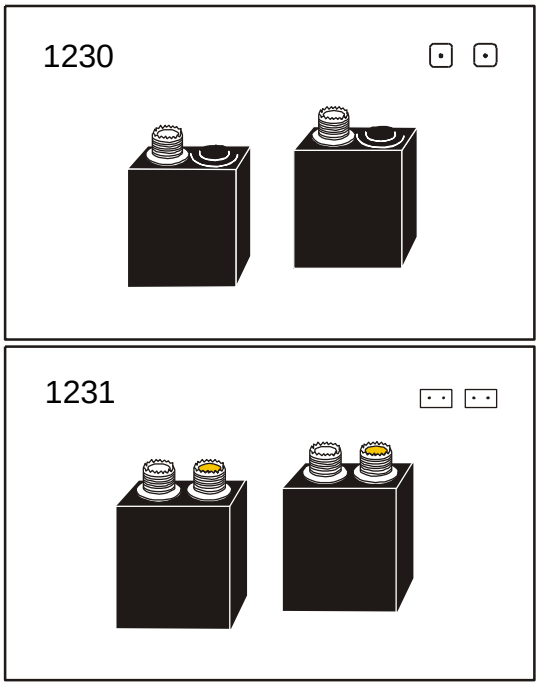
It is recommended to pull the cables between the pipe system and the cabinet through, for example, a PVC-duct. It gives a good protection and facilitates repairs of excavation damages and the like. Measure the connecting point on the pipes in relation to fixed points in the area.



Connecting and junction boxes

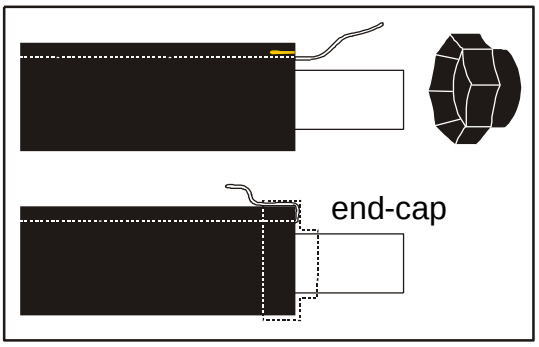
Application

Connecting and junction boxes are used when connecting a fault locator and when a jumper cable is installed in cellars or dry inspection chambers and when terminating circuits.

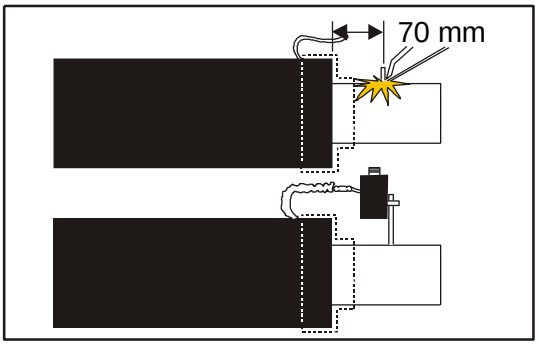


Installation in connection with end-cap

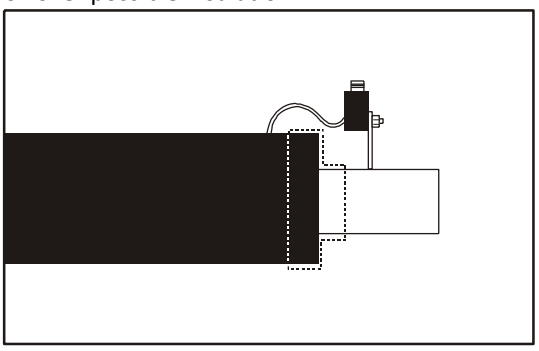
Place a piece of sealing strip on the end-cap prior to installation.
Press the straightened wire into the sealing strip.
Shrink the end-cap.



Weld the earth connection on 70 mm from the outer casing end.
Use long earth connection, part no. 1201 (10 pcs.) to raise the box above the insulation.
Fit the wire with flex, clean, connect and solder it.

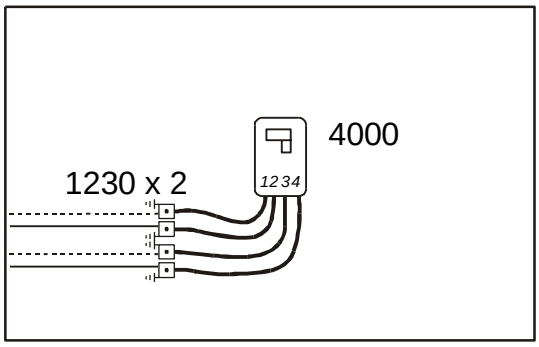


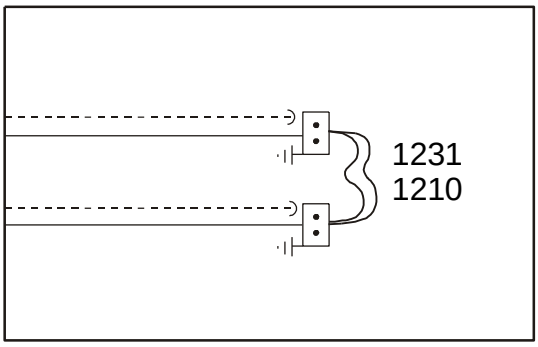
The wire from the connecting/junction box must face towards the outer casing.
Long earth connection should be used to get the box over possible insulation.



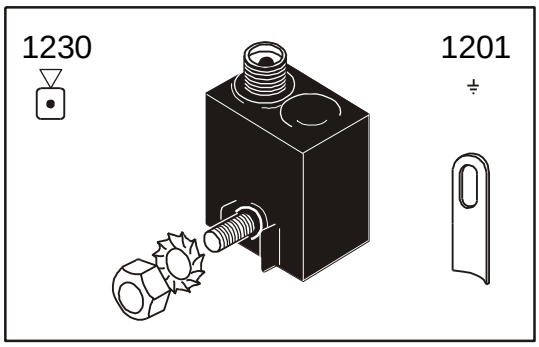
Connection box in connection with surveillance unit

Use a connecting box no. 1230 with 1 coaxial bush, when terminating from the pipe system, connected to a surveillance unit.
This is made at the pipe end on introduction to boiler houses, cellars or dry chambers.
The illustration shows the symbol from the circuit diagram.

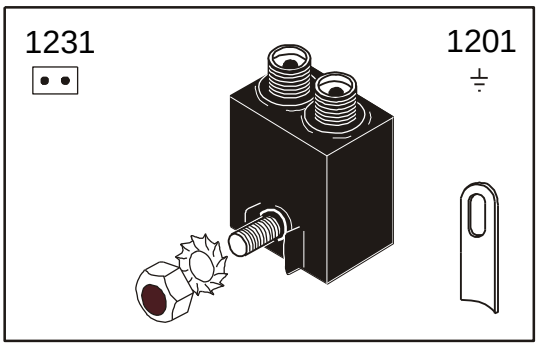




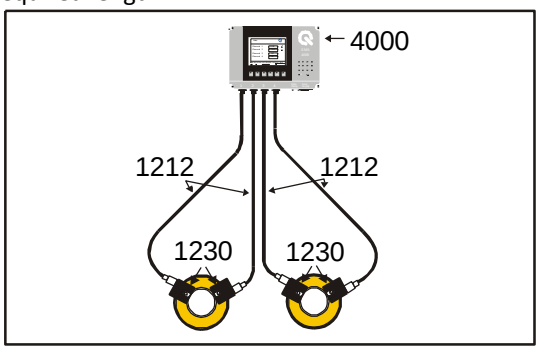
Use long earth connection, part no. 1201 (10 pcs.) so the box is raised above the insulation.



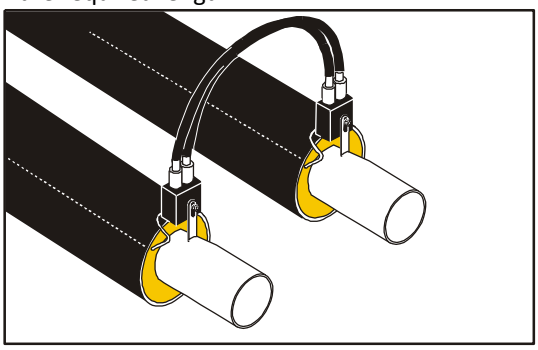
Use long earth connections, part no. 1201 (10 pcs.) so the box is raised above the insulation.



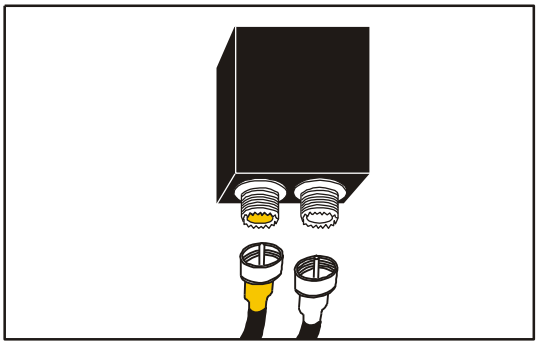
The cable between the connecting box and fault locator must be a minimum of 5 m.
The length between connecting box and detector is optional.
If the distance is larger, order a special cable of the required length.



Connect the 2 junction boxes with 1, 3 or 5 m cables. If the distance is larger, order a special cable of the required length.



Note! The colour marking, yellow/white, and the colours in the junction box must correspond.



Junction box in connection with jumper connection

Use junction box, part no. 1231, with 2 coaxial bushes, when a connection is made between the pipe ends within boiler houses, cellars or dry chambers.
The illustration shows the symbol from the circuit diagram.

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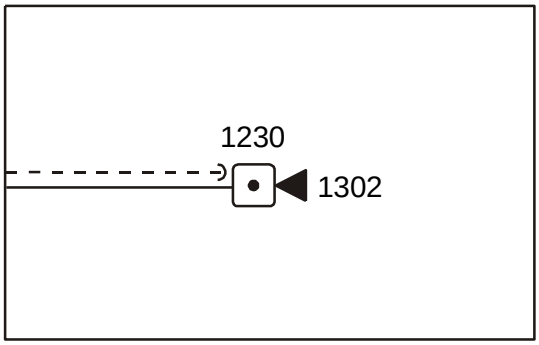
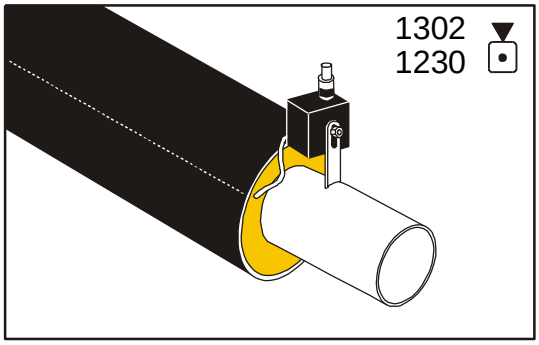
End component and adaptor box, fault locator

Termination of circuit with end component

Use an end component (with black marking), part no. 1302, together with an adaptor box, part no. 1230, when a detector circuit is terminated in a building, dry inspection chambers or the like.
The illustration shows the symbol from the circuit diagram.

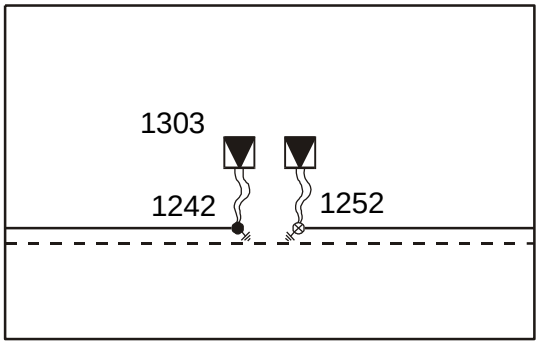


Use long earth connection, part no. 1201 to raise the box above the insulation.

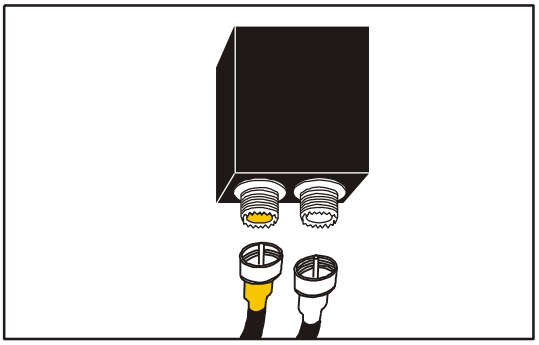


Termination of circuit with adaptor box

When a fault locator circuit is terminated in the earth, the signal is transmitted up from a muff joint by means of a double cable and terminated in a building or cable cabinet, part no. 1303.
The illustration shows the symbol from the circuit diagram.



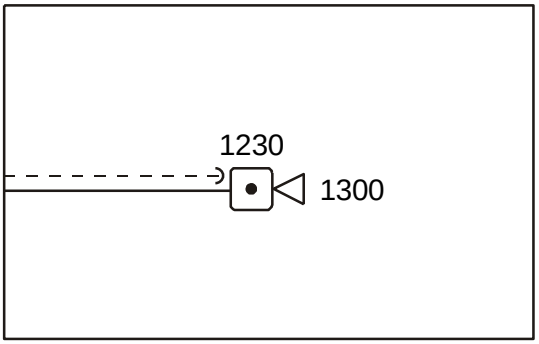
The cable colour must correspond with the colours on the connections of the adaptor box.



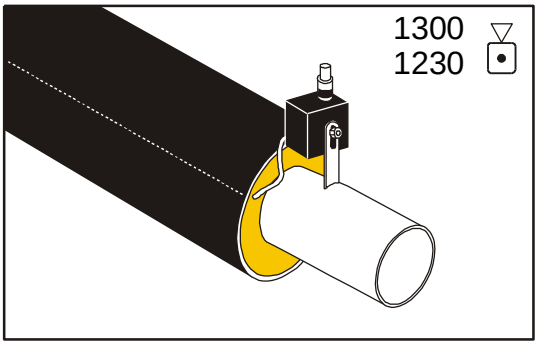
End component and adaptor box, detector

Termination of circuit with end component

Use an end component (with red marking), part no. 1300 together with an adaptor box, part no. 1230, when a detector circuit is terminated in a building, dry inspection chambers or the like.
The illustration shows the symbol from the circuit diagram.

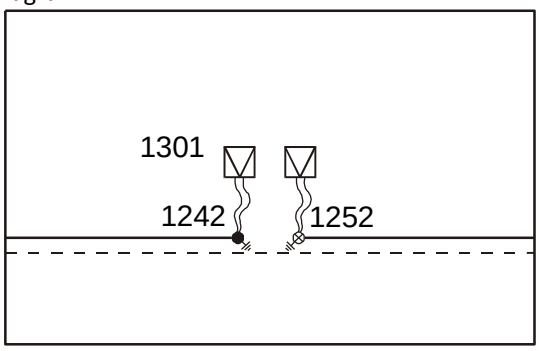


Use long earth connection, part no. 1201 to raise the box above the insulation.

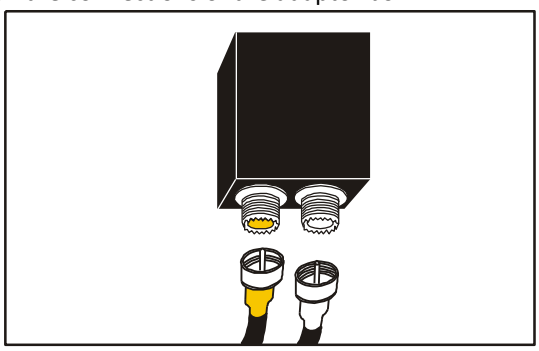


Termination of circuit with adaptor box

When a detector circuit is terminated in the earth, the signal is transmitted up from a muff joint by means of a double cable and terminated in a building or cable cabinet, part no. 1301.
The illustration shows the symbol from the circuit diagram.



The cable colour must correspond with the colours on the connections of the adaptor box.



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