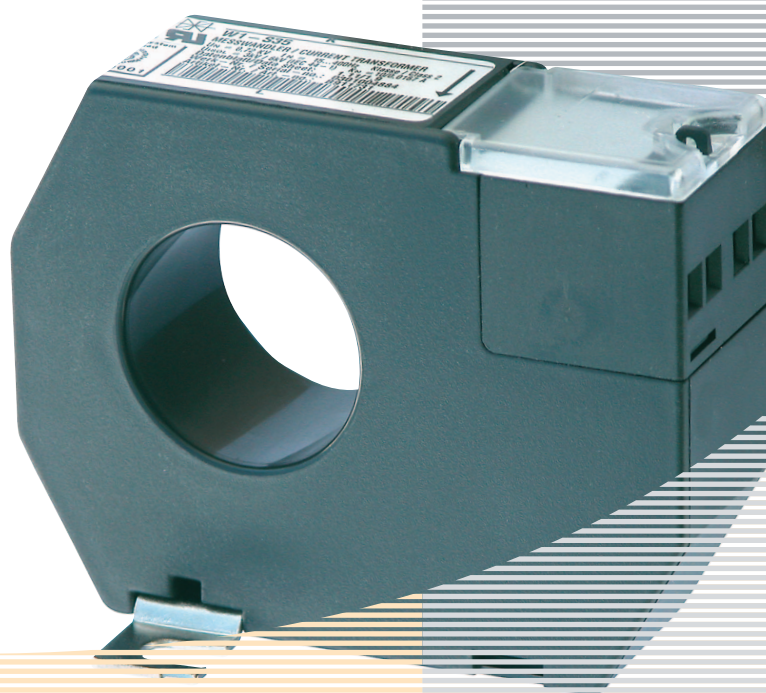


Installation instructions for BENDER measuring current transformers



Installation instructions for BENDER measuring current transformers

1. General information:

1.1 Intended use:

Please refer to the notes relating to the utilization of this measuring current transformer in the data sheets for the corresponding devices or systems. When used in connection with BENDER products, the measuring current transformers are suitable for the following applications:

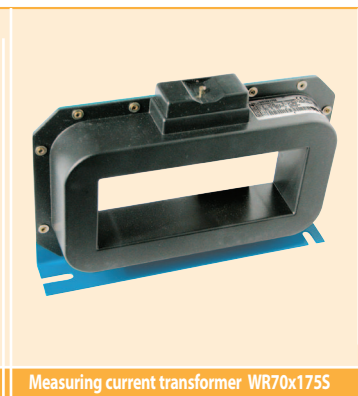
- 1.1.1 RCM (residual current monitors) for the measurement of AC residual currents and operating currents up to 100 A.
- 1.1.2 RCMS systems (residual current monitoring systems) for measurement of AC residual currents and operating currents up to 100 A.
- 1.1.3 RCMA (AC / DC residual current monitors) for the measurement of AC / DC residual currents and operating currents up to 10 A.
- 1.1.4 EDS systems (insulation fault location systems) for localisation of insulation faults in IT systems.
- 1.1.5 Measuring current transformers measure residual currents that occur due to insulation faults. The connected devices evaluate these and generate a corresponding alarm message.

2. Range of types:

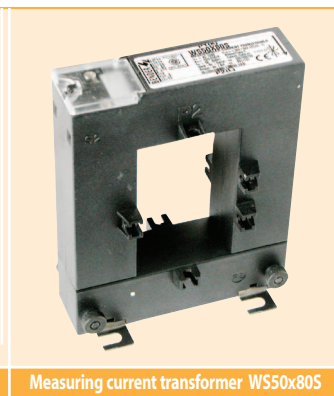
2.1 Standard type W...:



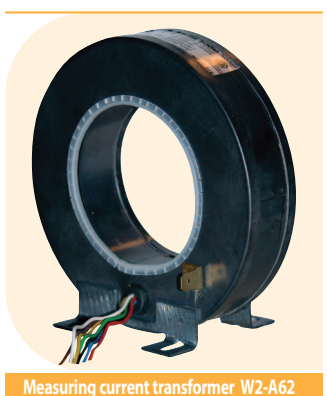
2.2 Rectangular type WR...:



2.3 Split-core type WS...:



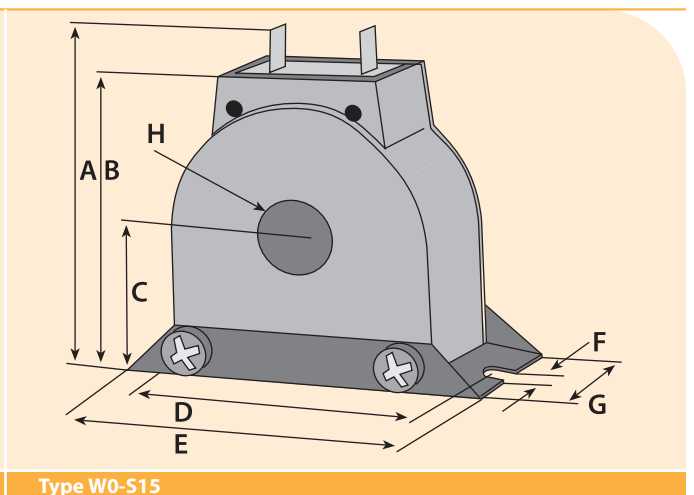
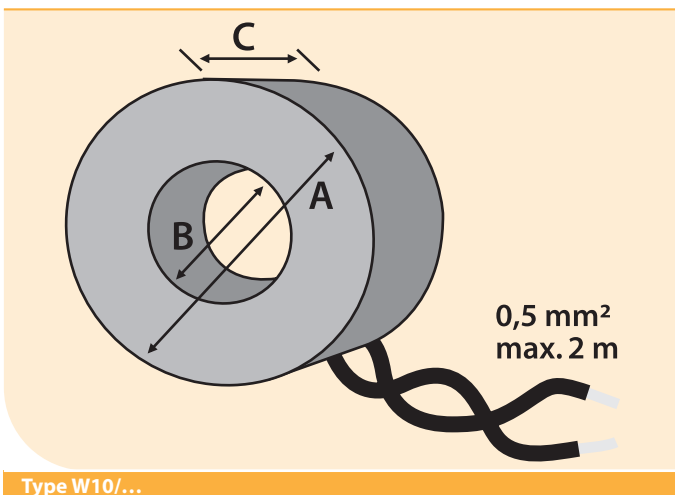
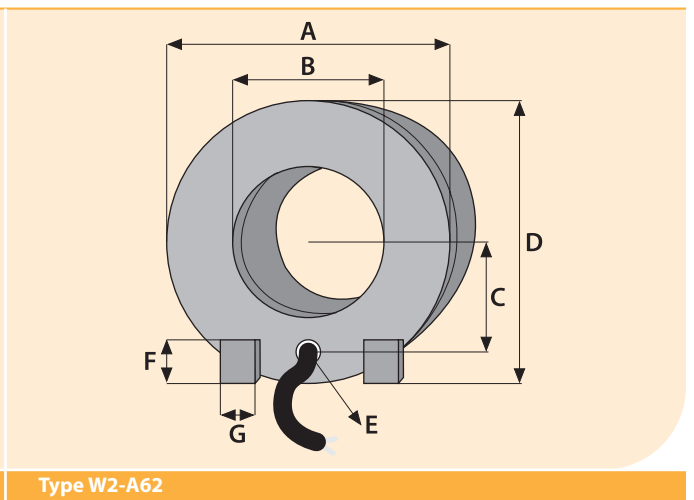
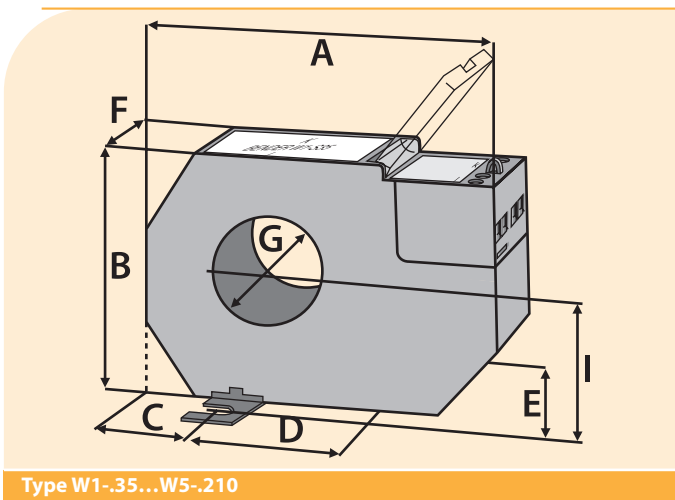
2.4 Flexible type W...:



3. Type overview:

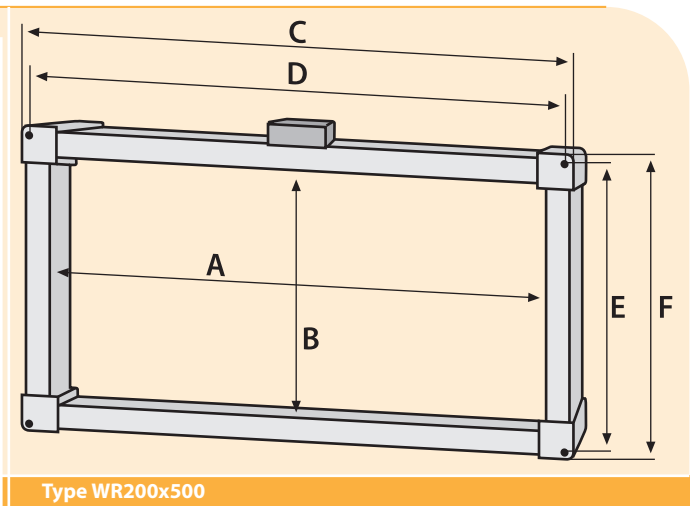
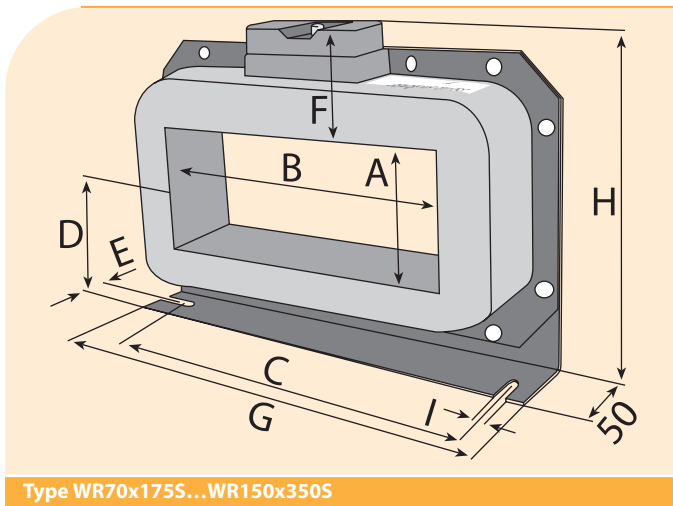
3.1 Standard type W...

Type	Dimensions / mm									Weight	Art. No.	Application	
	A	B	C	D	E	F	G	H	I			EDS...	RCM...
W10/600	∅ 37	∅ 10	18	--	--	--	--	--	--	0.05 kg	B 911 761	EDS470	RCM(S)
W0-S15	71	62	28.5	67	75	4,3	30.5	∅ 14.5	--	0.15 kg	B 911 753	EDS470	RCM(S)
W1-S35	100	79	26	48.5	33	46	∅ 35	--	44	0.25 kg	B 911 731	EDS470	RCM(S)
W2-S70	130	110	32	66	33	46	∅ 70	--	58	0.38 kg	B 911 732	EDS470	RCM(S)
W3-S105	170	146	38	94	33	46	∅ 105	--	74	0.60 kg	B 911 733	EDS470	RCM(S)
W4-S140	220	196	48.5	123	33	46	∅ 140	--	99.5	1.50 kg	B 911 734	EDS470	RCM(S)
W5-S210	299	284	69	161	33	46	∅ 210	--	143	2.80 kg	B 911 735	EDS470	RCM(S)
W1-35	100	79	26	48.5	33	46	∅ 35	--	44	0.15 kg	B 911 772	--	RCM(S)
W2-70	130	110	32	66	33	46	∅ 70	--	58	0.20 kg	B 911 773	--	RCM(S)
W3-105	170	146	38	94	33	46	∅ 105	--	74	0.45 kg	B 911 774	--	RCM(S)
W4-140	220	196	48.5	123	33	46	∅ 140	--	99.5	0.65 kg	B 911 775	--	RCM(S)
W5-210	299	284	69	161	33	46	∅ 210	--	143	1.20 kg	B 911 776	--	RCM(S)
W10/8000	∅ 37	∅ 10	18	--	--	--	--	--	--	0.07 kg	B 911 759	EDS473 / 474	--
W1-35/8000	100	79	26	48.5	33	46	∅ 35	--	44	0.27 kg	B 911 756	EDS473 / 474	--
W1-A35S	100	79	26	48,5	33	46	∅ 35	--	44	0.20 kg	B 911 744	--	RCMA
W2-A70S	130	110	32	66	33	46	∅ 70	--	58	0.40 kg	B 911 746	--	RCMA
W3-A105S	170	146	38	94	33	46	∅ 105	--	74	0.60 kg	B 911 745	--	RCMA
W4-A140S	220	196	48.5	123	33	46	∅ 140	--	99.5	1.30 kg	B 911 747	--	RCMA
W5-A210S	299	284	69	161	33	46	∅ 210	--	143	1.80 kg	B 911 748	--	RCMA
W2-A62	∅ 110	∅ 62	44	111.5	∅ 7.5	15	15	--	--	0.27 kg	B 911 762	--	RCMA



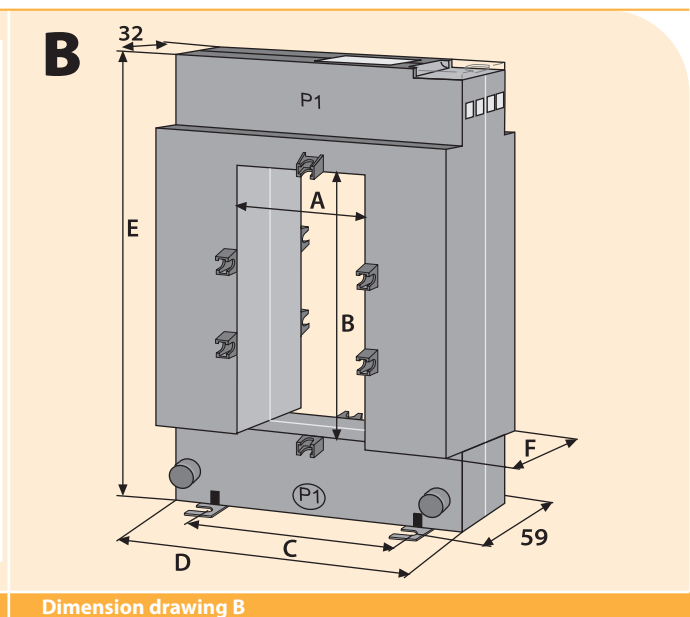
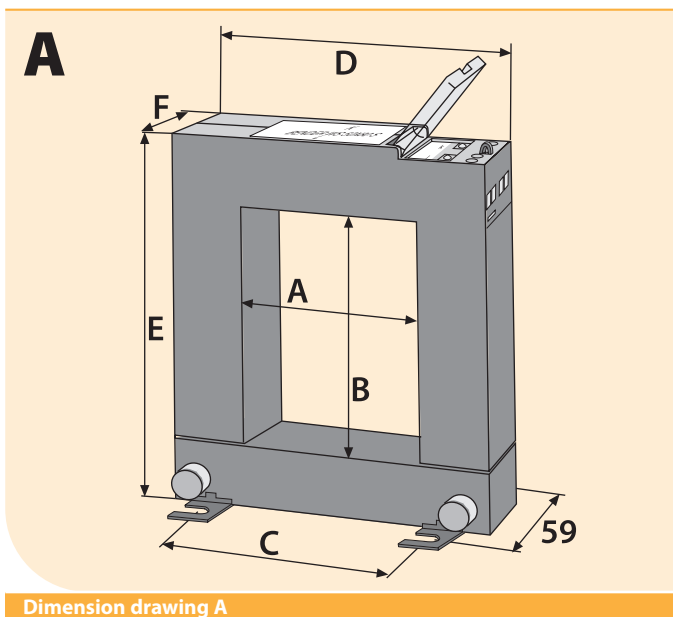
3.2 Rectangular type WR...

Type	Dimensions / mm									Weight	Art. No.	Application	
	A	B	C	D	E	F	G	H	I			EDS470	RCM(S)
WR 70x175S	70	175	225	85	22	46	261	176	7.5	2.9 kg	B 911 738	EDS470	RCM(S)
WR 115x305S	115	305	360	116	25	55	402	240	8	6.3 kg	B 911 739	EDS470	RCM(S)
WR 150x350S	150	350	415	140	28	55	460	285	8	8.25 kg	B 911 740	EDS470	RCM(S)
WR 200x500S	200	500	585	568.5	268.5	285	--	--	--	9.0 kg	B 911 763	EDS470	RCM(S)



3.3 Split-core type WS...

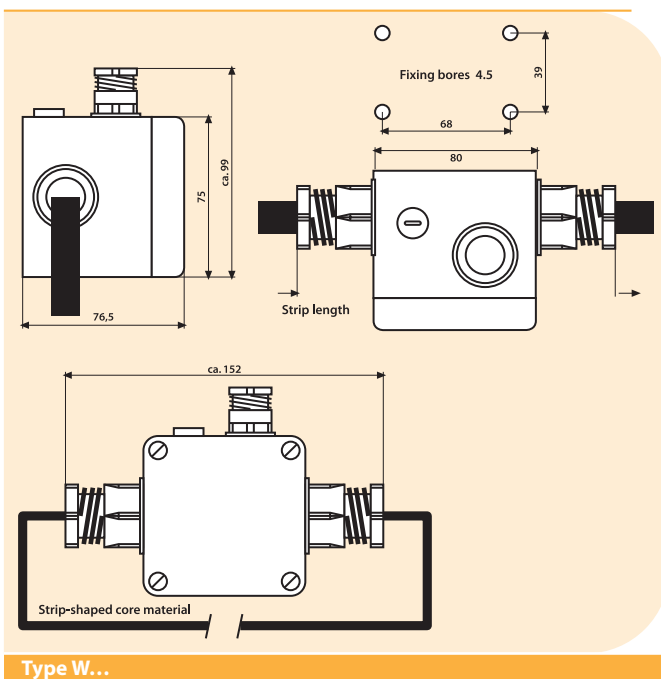
Type	Dimension drawing	Dimensions / mm						Weight	Art. No.	Application	
		A	B	C	D	E	F			EDS470	RCM(S)
WS50x80S	A	50	80	78	114	145	32	0.90 kg	B 911 741	EDS470	RCM(S)
WS80x80S	A	80	80	108	144	145	32	1.05 kg	B 911 742	EDS470	RCM(S)
WS80x120S	A	80	120	108	144	185	32	1.25 kg	B 911 743	EDS470	RCM(S)
WS80x160S	B	80	160	120	184	225	52	2.55 kg	B 911 755	EDS470	RCM(S)
WS20x30/8000	B	20	30	51	89	110	40	0.75 kg	B 911 764	EDS473 / 474	--
WS50x80/8000	A	50	80	78	114	145	32	1.20 kg	B 911 757	EDS473 / 474	--



3.4 Flexible type W...

Type	Strip length / mm	Weight	Art. No.
W500	500	0.65 kg	B911707
W600	600	0.65 kg	B911708
W700	700	0.66 kg	B911709
W800	800	0.66 kg	B911712
W900	900	0.75 kg	B911713
W1000	1000	0.70 kg	B911711

Only for RCM(S) application $I_{\Delta n} > 100$ mA



4. Transformer selection

4.1 The smallest possible measuring current transformer should be used so as to minimize interference on the transformer.

Selecting the right measuring current transformer type

The following table can be used to determine the smallest possible measuring current transformer type depending on the cable cross-sections:

External diameter of cables and wires

Nominal cross-section mm ²	Approx. external diameter				
	NYM mm	NYY mm	NYCY / NYCWY mm	H07RN-F mm	NSSHÖU mm
3 x 1.5	10	11	13	12.5	15
3 x 2.5	11	13	14	14.5	16.5
3 x 4	12.5	15	16	16	20
3 x 6	14	16	17	20	22
3 x 10	17	19	18	25.5	--
3 x 16	20	21	21	29	--
4 x 1.5	10.5	13	14	13.5	16
4 x 2.5	12	14	15	15.5	19
4 x 4	14	16	17	18	21.5
4 x 6	15	17	18	22	23
4 x 10	18	20	20	23	27.5
4 x 16	23	23	23	32	32
4 x 25	27.5	27	28	37	39
4 x 35	31	30	29	42	42.5
4 x 50	--	35	34	48	49
4 x 70	--	40	37	54	--
4 x 95	--	45	42	60	--
4 x 120	--	50	47	65.5	--
4 x 150	--	53	52	--	--
4 x 185	--	60	60	--	--
4 x 240	--	71	70	--	--
5 x 1.5	11	13.5	15	15	17
5 x 2.5	13	15	17	17	20
5 x 4	15	16.5	18	19	23
5 x 6	18	19	20	24	26.5
5 x 10	20	21	--	30	30
5 x 16	24	23	--	35	34
5 x 25	31	--	--	41	42

NYM	PVC insulated cable
NYY	cable with PVC insulation
NYCY	cable with concentric conductor and PV insulation
NYCWY	cable with concentric, wave-shaped PE conductor and PVC insulation
H07RN-F	rubber-insulated flexible cable for medium mechanical stress
NSSHÖU	rubber-insulated flexible cable for high mechanical stress

Cable type	Application
H07RN-F, A07RN-F	• connection of loads
H05RN-F, A05RN-F	• connection of hand-operated tools with a cable of max. 4 m
NSSHÖU	• for very high mechanical stress instead of H07RN-F
NSHTÖU	• for hoists and transport systems with frequent winding and unwinding
Cable reel	• for rolling and unrolling connected cables with plug-in devices, insulating material type, IP X 4
PVC-insulated cable	• not permitted on construction sites

5. Safety instructions:

5.1 Installation, connection and commissioning must be carried out by qualified personnel in consideration of:

- 5.1.1 the current safety regulations
- 5.1.2 the data sheet that comes with the device entitled "Important safety instructions for BENDER products".

5.2 Installation and connection:

Before you install the device and commence work on the connections make sure that the system is isolated. Failure to do so exposes the personnel to the danger of electric shock. In addition, the electrical installation could be damaged and the device destroyed.

6. Installation

6.1 General notes:

6.1.1 The measuring current transformer should not be located near large magnetic fields (e. g. transformer, circuit-breaker or adjacent conductor rails) as these stray fields could negatively affect the output signal of the measuring current transformer.

6.1.2 Mechanical elements for fixing the measuring current transformer must not be led through the opening for the live cables.

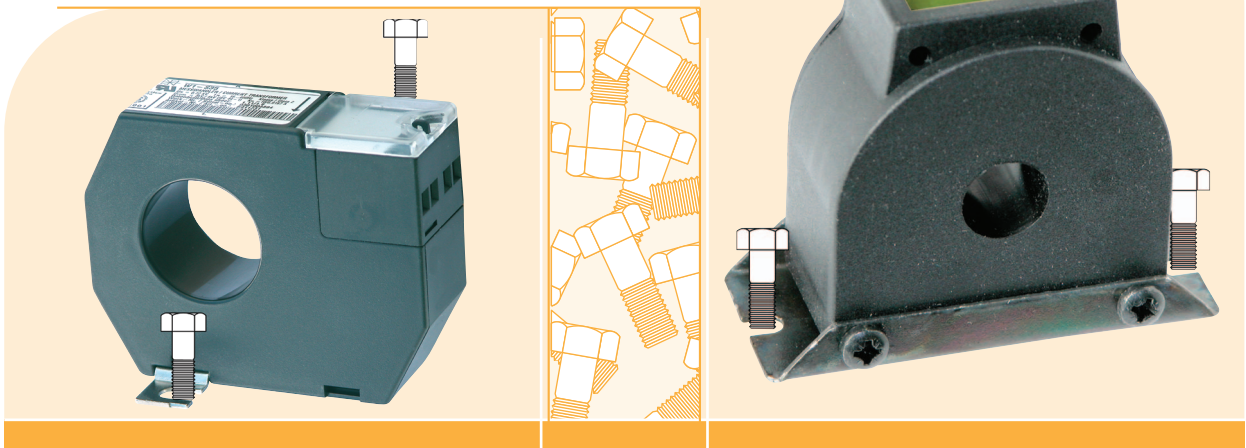
6.2 Installation of standard type W...:

6.2.1 W1...35...- W5...210...

Insert the supplied brackets for fixing the screws into the side of the enclosure of the measuring current transformer. Type W1...35... has two brackets, all other measuring current transformers are fixed with four brackets. Mount the measuring current transformer in a suitable location using the M5 screws.

6.2.2 W0-S15

Mount the measuring current transformer in a suitable location using the two M4 screws.



6.2.3 W10-...

Mount the measuring current transformer directly on the cable that is to be monitored using a cable tie.

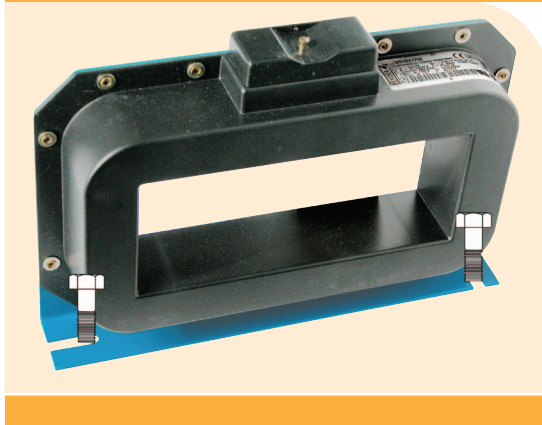
6.2.4 W2-A62

Mount the measuring current transformer in a suitable location using the four M5 screws.



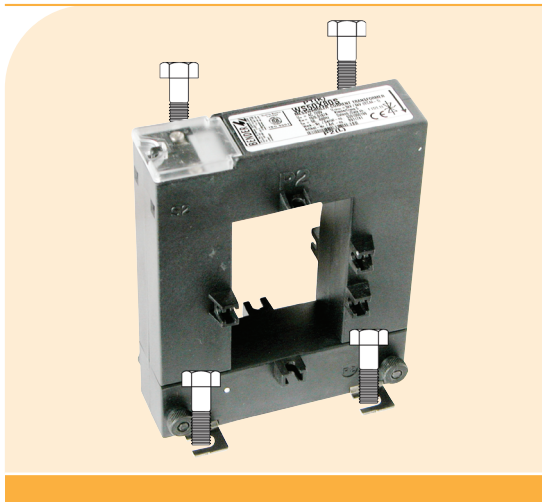
6.3 Installation of rectangular type WR...:

Mount the measuring current transformer in a suitable location using the to M5 screws.



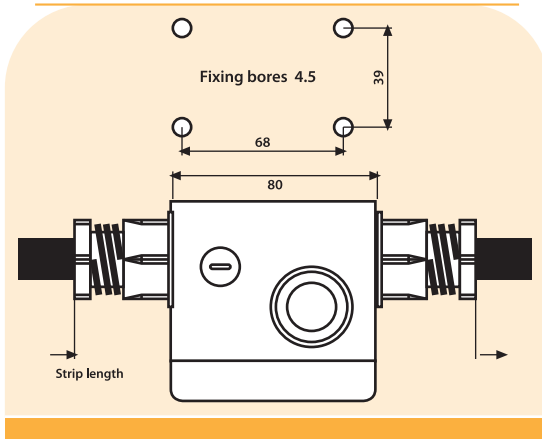
6.4 Installation of split-core type WS...:

Insert the supplied brackets for fixing the screws into the side of the enclosure of the measuring current transformer. Mount the measuring current transformer in a suitable location using the four M5 screws.



6.5 Installation of flexible type W...:

Mount the measuring current transformer in a suitable location using the four M4 screws.



7. Connections:

7.1 Connection type:

- 7.1.1 Screw terminal connection:
 - Connection, rigid / flexible 0.2...4 mm² / 0.2...2.5 mm²
 - Connection, flexible with ferrules, without / with plastic sleeve 0.25...2.5 mm²
 - Conductor sizes (AWG) 24-12
- 7.1.2 Plug connection:
 - FASTON 6.3 x 0.8

7.2 Connecting cable to measuring current transformer:

- 7.2.1 Single wire ≥ 0.75 mm² 0...1 m
- 7.2.2 Single wire twisted ≥ 0.75 mm² 1...10 m
- 7.2.3 Shielded cable ≥ 0.6 mm², Cable type, e. g. J-Y(ST)Y 2 x 0.6 10...40 m

7.3 Degree of protection:

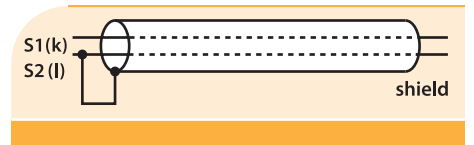
- 7.3.1 Internal components (DIN EN 60529) IP40
- 7.3.2 Terminals (DIN EN 60529) IP20

7.4 Connection:

7.4.1 Connect the measuring current transformer with two or four connecting wires to the corresponding device or system. Please refer to the instructions in the technical data. Depending on the design, the connections can also be marked with S1 (instead of k) and S2 (instead of l).

7.4.2 Working with shielded cable

7.4.2.1 For EDS application:
Connect shield on one side to S2 (l)



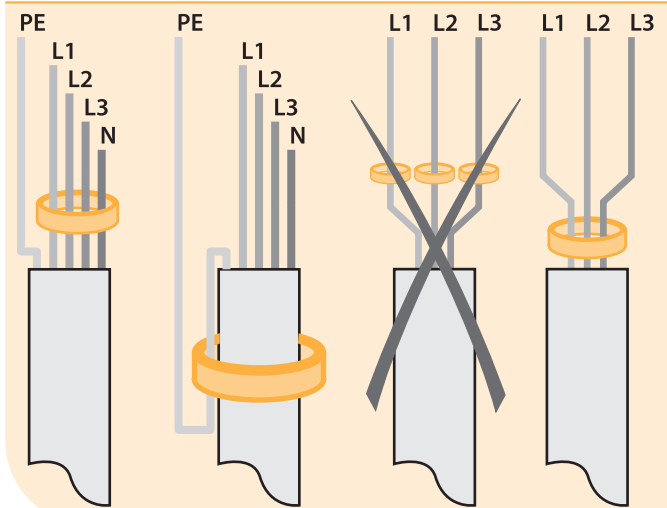
7.4.2.2 For RCM application:
Connect shield on one side to PE



7.4.3 If the connection between the measuring current transformer and the evaluator is interrupted, the measuring current transformer connections is protected with an internal suppressor diode and do not need to be short-circuited and earthed. The max. output voltage is 6.8 V.

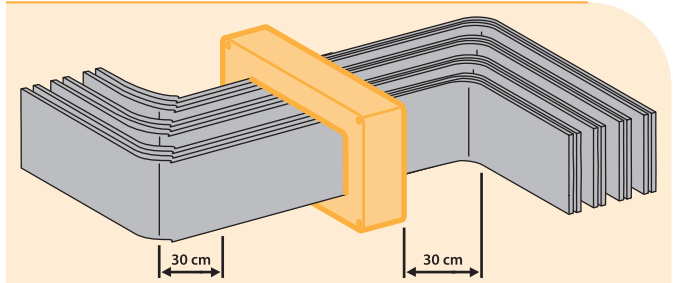
8. Cable inlet:

8.1 Examples of cable routing through the measuring current transformer, see 8.2

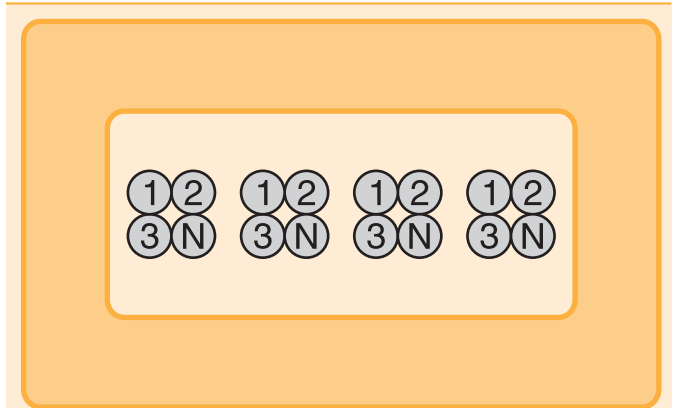


Example 1

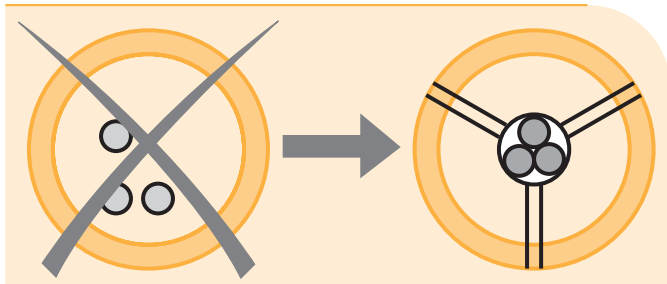
Example 2



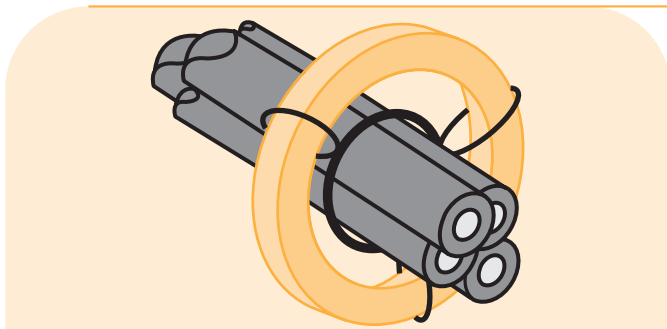
Example 5



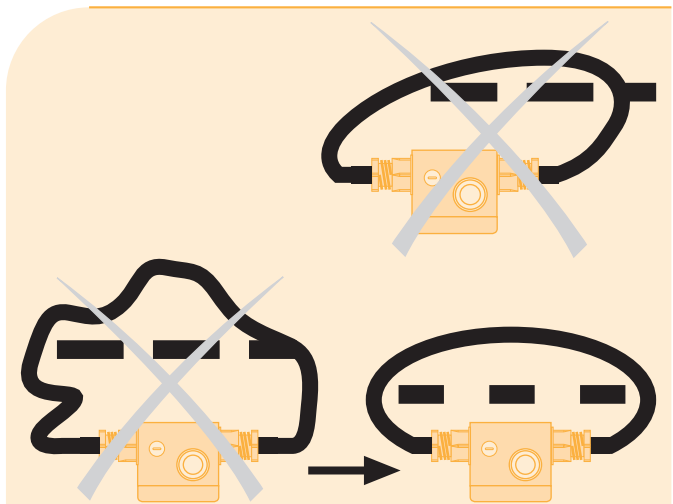
Example 6



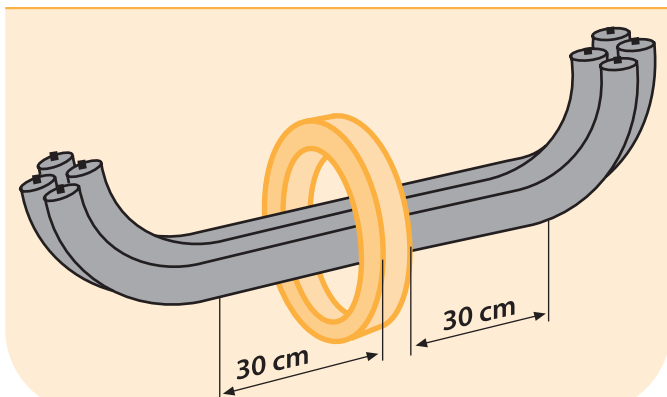
Example 3



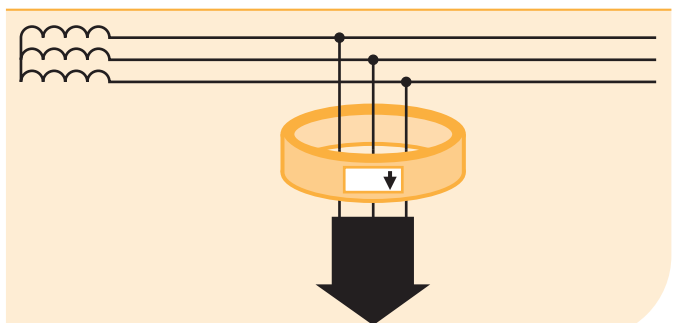
Example 4



Example 7



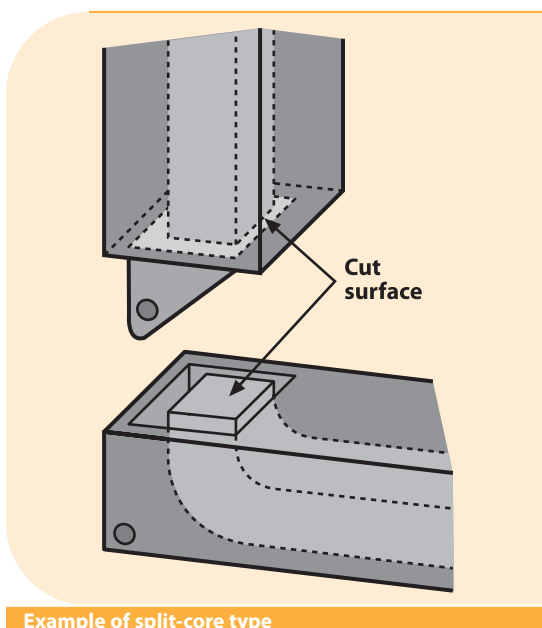
Example 5



Example 8

8.2 Lead the conductor to be monitored through the measuring current transformer. Please note:

- 8.2.1 When measuring residual current, the PE must not be led through the measuring current transformer (Example 1).
- 8.2.2 A Holmgreen connection is not suitable for measuring residual current. A correspondingly larger measuring current transformer is more suitable (Example 2).
- 8.2.3 Conductors should be installed at the center of the measuring current transformer as far away as possible from the body (Example 3).
- 8.2.4 Cable and conductor rails should be led through the measuring current transformer symmetrically and at a right-angle (Example 4).
- 8.2.5 Bends in the conductor should be at least 30 cm away from the measuring current transformer (Example 5).
- 8.2.6 Cable bundles should be bunched symmetrically and led through the measuring current transformer (Examples 3, 4, 6).
- 8.2.7 Flexible type (Example 7):
 - 8.2.7.1 The conductors must be led through the measuring current transformer symmetrically keeping the greatest possible distance to the flexible magnetic strip.
 - 8.2.7.2 Unnecessary loops of the magnetic strip must not be installed.
 - 8.2.7.3 The insulation resistance must be guaranteed via the cable or, in the case of conductor rails, by maintaining an appropriate distance.
- 8.2.8 In some applications, e.g. the directionally discriminating residual current measurement, the installation direction is very important. For this reason, measuring current transformers must always be installed with the arrow pointing in the direction of the outgoing circuit or the load (Example 8).



Example of split-core type

- 8.2.9 When installing the split-core and flexible types, the cut surface of the core must be clean. A build-up of dirt alters the properties and sensitivity of the measuring current transformer. After cleaning with a solvent, the surface should be gently rubbed with oil to prevent corrosion.

The polished cut surfaces of the toroidal core must not be touched! Fingerprints and perspiration can lead to oxidation and have a negative impact on the properties of the measuring current transformer. The cut surfaces of the closed measuring current transformer must lie flat. The build-up of dirt must be prevented and existing dirt must be removed.

- 8.2.10 The highest voltage for electrical equipment for all measuring current transformers is $U_m = 0.72$ kV. Non-insulated conductor rails up to this voltage can be led through the opening. In the case of utilization with higher voltages up to 10 kV, the cable must have the corresponding insulation voltage.
- 8.2.11 The secondary circuit S1(k) / S2 (l) in measuring current transformers is marked with a corresponding label

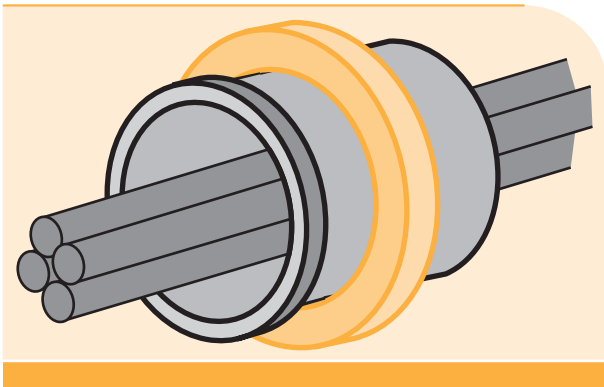


In the case of measuring current transformers that do not carry this label, operating the measuring current transformer with an open secondary circuit could lead to hazardous voltages at the secondary terminals. In this case, "open operation" must be avoided at all costs by short-circuiting the measuring current transformer. The shorting bar should only be removed when all installation and wiring work has been completed.

A split-core measuring current transformer that does not carry this label should never be installed on live cables before the secondary output has been short-circuited. Otherwise, hazardous voltages could occur at the secondary terminals at the moment in which the measuring current transformer is closed.

9. Accessories:

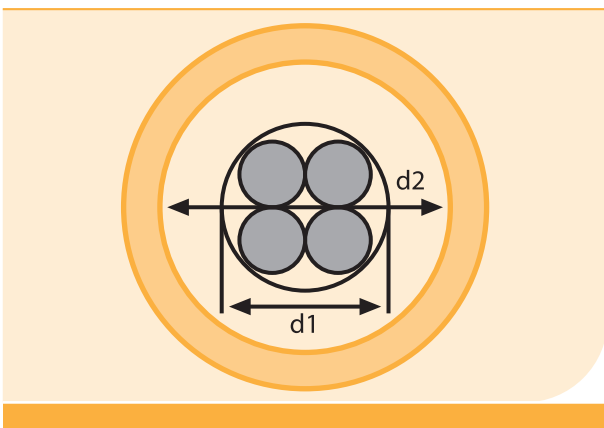
9.1 Symmetry rings: when used in circuits with high load or making currents, local saturation of the magnetic material in the core of the measuring current transformer may occur. For this reason it is recommended to use a symmetry ring to prevent false tripping during RCM applications. This is always recommended in connection with high load currents. These symmetry rings are available for the closed version of the measuring current transformer W0... W5...



9.2 A symmetry ring is recommended if the current loads exceed those in the table.

Measuring current transformers	Maximum load current (A)
W0-S15	100
W1-S35	400
W2-S70	600
W3-S105	800
W4-S140	2000
W5-S210	3000

These values apply under the following conditions:
 internal diameter of the measuring current transformer $d2 > 2 \times d1$ (cable diameter)



10. Special application: parallel connection

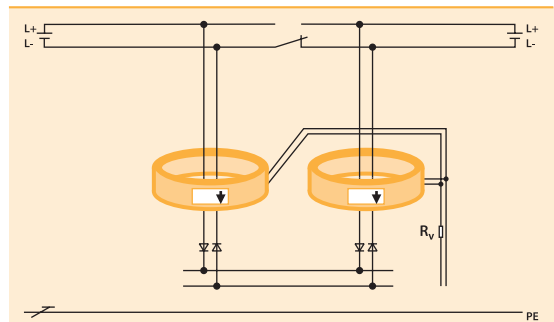
10.1 The following must be observed for the parallel connection of measuring current transformers in conjunction with insulation fault detection systems (EDS) in diode decoupled DC systems:

10.1.1 Arrows on both measuring current transformers must point in direction of load.

10.1.2 Same polarity of both measuring current transformers S1 (k) with S1 (k) and S2 (l) with S2 (l)

10.1.3 If possible, deactivate measuring current transformer monitoring.

If this is not possible, a series resistor of 2 Ohm (in the case of W...8000 200 Ohm) must be series connected.



Example of diode decoupled systems

11. Functional test:

It is recommended to carry out an appropriate functional test on the connected devices or systems to test the functionality of the measuring current transformers. Notes relating to the tests can be found in the instruction leaflet that comes with the device as well as in the technical manuals for the devices.

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