INSTRUMENT

TRANSFORMERS

Up to 36 kV

MAG ELECTRIC Co.

Manufacturer of Low and Medium Voltage Instrument Transformers with the Cooperation and Manufacturing License of SIEMENS and MESSWANDLER-BAU (MWB) of Germany

ISO 9001 Registered Firm CISQ IMQ CSQ

CERTIFIED IQNet QUALITY SYSTEM

40th ANNIVERSARY 2013

SIEMENS

INTERTEK

CE

KEMA

2013-06-25

INTRODUCTION

Mag Electric Corporation, a manufacturer of current and voltage instrument transformers, was founded in 1973 by Mr. Mohsen Farjad-Rad. Mr. Farjad-Rad graduated with a M.Sc. degree in electrical engineering from Germany and has several years of industry experience working for a number of reknowed electrical equipment manufactures; including 8 years at SIEMENS of Germany and Iran.
MAG Electric manufacturing plant is located in 'Alborz Industrial City', 120 km west of Tehran.

Mohsen Farjad-Rad

The production of the low voltage current transformers was started with the cooperation and license of Messwandler GmbH (MWB) of Germany, a world leader in manufacturing instrument transformers.
Mag electric low voltage current transformers are manufactured in the most applicable models with full compliance to the international Electro-Technic Commission code (IEC60044-1 , IEC60044-2) and version Deutscher Electrotechniker (VDE0414) of Germany.
The success of our products and the resulting expansion of our production line have resulted in continual customer satisfaction over more than four decades. As part of company's expansion plants, the production of medium voltage (MV) instrument transformers was started under the supervision and manufacturing license of SIEMENS, Germany.
Mag Electric has received the Quality certificate for its MV transformers by the German institute I.P.H in 1995 and renewed it for a wide range of new and old products on 2005, which are manufactured in accordance to international standards. Mag Electric has also been accredited for laboratory competence by the Iranian Industrial Research & Standards Institute.
Other certificates and trophics of Mag Electric Corp. include: Type Test certificate from KEMA, CE and S-mark from SEMKO, Certificate of quality for domestic standard from the Iranian Industrial Research & Standards Institute, National quality control award in 2005, and provincial production award in 2003, Iso9001 from IMQ and member of IQnet.
By increasing its production capacity, Mag Electric has been able to respond to the highly growing demand in the domestic and international markets over the past decade. To achieve our best customer satisfaction, our R&D section has designed several new models to constantly address our valued customers `needs requirements.
With the extensive experience and expertise of Mr. Farjad-Rad and his management team, specially Mr. Kian Haeri, Vice president and director of the LV department, and Mr. Mohammad-reza Mir Mohammad-Sadegh, director of MV department, Mag Electric has become a well-respected and reputable company in Iran.
We take pleasure in offering this brochure to our dear customers, covering our latest production range of instrument transformers in order to facilitate their selection of required models and technical specifications.

CISQ is a member of

IQNet
THE INTERNATIONAL CERTIFICATION NETWORK
www.iqnet-certification.com

IQNet, the association of the world's first class certification bodies, is the largest provider of management System Certification in the world. IQNet is composed of more than 30 bodies and counts over 150 subsidiaries all over the globe.

CSQ
www.imq.it

CERTIFICATO N.
CERTIFICATE N. **9101.B212**

SI CERTIFICA CHE IL SISTEMA QUALITA' DI
WE HEREBY CERTIFY THAT THE QUALITY SYSTEM OPERATED BY

MAG ELECTRIC CO.

NO. 26, 4TH ST., NORTH FALAMAK ST., 4th PHASE - SHAHRAK GHARB, TEHRAN IRAN

UNITA' OPERATIVE
OPERATIVE UNITS

NO. 26, 4TH ST., NORTH FALAMAK ST., 4th PHASE - SHAHRAK GHARB, TEHRAN IRAN

WEST MIRDAMAD BLVD, 2ND SQUARE - ALBORZ INDUSTRIAL CITY, QAZVIN IRAN

E' CONFORME ALLA NORMA
IS IN COMPLIANCE WITH THE STANDARD

ISO 9001:2008

PER LE SEGUENTI ATTIVITA'
FOR THE FOLLOWING ACTIVITIES

Design, manufacturing & providing after sales services for instrument current and voltage transformers up to 36KV sector

Riferirsi al manuale della qualità per l'applicabilità dei requisiti della norma ISO 9001:2008
Refer to quality manual for details of applications to ISO 9001:2008 requirements

IL PRESENTE CERTIFICATO E' SOGGETTO AL RISPETTO DEL
REGOLAMENTO PER LA CERTIFICAZIONE DEI SISTEMI DI GESTIONE

THE USE AND THE VALIDITY OF THE CERTIFICATE SHALL SATISFY THE REQUIREMENTS OF THE RULES FOR CERTIFICATION OF MANAGEMENT SYSTEMS

DATE:	PRIMA CERTIFICAZIONE *FIRST CERTIFICATION*	EMISSIONE CORRENTE *CURRENT ISSUE*	SCADENZA *EXPIRY*
	2012-10-15	2015-09-18	2018-09-17

IMQ S.p.A.- VIA QUINTILIANO, 43 - 20138 MILANO ITALY

CISQ è la Federazione Italiana di Organismi di Certificazione dei sistemi di gestione aziendale.

CISQ is the Italian Federation of management system Certification Bodies.

FEDERAZIONE CISQ
www.cisq.com

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
IAF: 19

SGQ N°005A, SGA N°006D,SCR N°005F
SSI N°003G, FSM N°007I, SGE N°006M
EMAS N°003P, PRD N°005B,PRS N°080C,
ISP N°063E, LAB N°0121, LAT N°021
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

La validità del certificato è subordinata a sorveglianza annuale e riesame completo del Sistema di Gestione con periodicità triennale
The validity of the certificate is submitted to annual audit and a reassessment of the entire Management System within three years

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and its partner
CISQ/IMQ-CSQ
hereby certify that the organization

MAG ELECTRIC CO.

NO. 26, 4TH ST., NORTH FALAMAK ST., 4th PHASE - SHAHRAK GHARB, TEHRAN IRAN

WEST MIRDAMAD BLVD, 2ND SQUARE - ALBORZ INDUSTRIAL CITY, QAZVIN IRAN

for the following field of activities
Design, manufacturing & providing after sales services for instrument current and voltage transformers up to 36KV sector
Refer to quality manual for details of applications to ISO 9001:2008 requirements
has implemented and maintains a
Quality Management System
which fulfills the requirements of the following standard

ISO 9001:2008

Issued on: 2015 –09 – 18 Expiry date: 2018 – 09 – 17

Registration Number: IT – 84400

The status of validity of the certificate can be verified at http://www.cisq.com or by e-mail to fedcisq@cisq.com

Michael Drechsel
President of IQNET

Ing. Claudio Provetti
President of CISQ

IQNet Partners*:
AENOR Spain AFNOR Certification France AIB-Vinçotte International Belgium APCER Portugal CCC Cyprus CISQ Italy CQC China CQM China CQS Czech Republic Cro Cert Croatia DQS Holding GmbH Germany FCAV Brazil FONDONORMA Venezuela ICONTEC Colombia IMNC Mexico Inspecta Certification Finland INTECO Costa Rica IRAM Argentina JQA Japan KFQ Korea MIRTEC Greece MSZT Hungary Nemko AS Norway NSAI Ireland PCBC Poland Quality Austria Austria RR Russia SIGE Mexico SII Israel SIQ Slovenia SIRIM QAS International Malaysia SQS Switzerland SRAC Romania TEST St Petersburg Russia TSE Turkey YUQS Serbia
IQNet is represented in the USA by: AFNOR Certification, CISQ, DQS Holding GmbH and NSAI Inc.
* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

LOW VOLTAGE

INSTRUMENT

TRANSFORMERS

720 V 1- 6000 A

MAG ELECTRIC Co.

Manufacturer of Low and Medium Voltage Instrument Transformers with the Cooperation and Manufacturing License of SIEMENS and MESSWANDLER-BAU (MWB) of Germany

40th ANNIVERSARY 2013

ISO 9001 Registered Firm CISQ IMQ CSQ

CERTIFIED IQNet QUALITY SYSTEM

SIEMENS IIRI MWB INTERTEK CE KEMA

LOW VOLTAGE CERTIFICATES

KEMA

CERTIFICATE

KEMA No.: 2038016.01

Client:
E.P.I.L. Co.
No. 6, 14th Alley, Jahan-ara street
Shahid-Gomnam freeway
Tehran, Iran

Manufacturer:
MAG-Electric Co.
No. 9, 23rd street,
Vozara Ave
Tehran, Iran

Apparatus : Testing of low voltage current transformers
Trade name : MAG-Electric
Type designation : AL...

Standard
IEC 60044-1:1996 Current transformers

The undersigned declares that the tested specimen of the described product complies with the stated standard.
This Certificate is granted on account of tests made in the KEMA laboratories and the Prof. Ir. Damstra Laboratory, Hengelo, The Netherlands; the results of which are stated in KEMA test report No. 2038016.01-QUA/COM

This Certificate does not include an assessment of the manufacturer's production. Conformity of this production with the specimen tested by KEMA is not the responsibility of KEMA.

KEMA Quality B.V.
Arnhem, December 3, 2003

H.H.M. Versteegen

Certificate

for European Product Safety

Reference No. 310810

Safety instrument transformer

Type designation	AL1, AL2, AL3, AL4, AL5
Certificate holder	**Mag Electric Co.** **No 9, 23th street** **Vozara Ave, Teheran** **IRAN**
The product complies with the standard(s)	EN 61558-1:1997+A1 EN 61558-2-6:1997
Date of expiry	31 December 2013
LVD information	*The product satisfies the provisions for CE marking according to the Low Voltage Directive 73/23/EEC and 93/68/EEC.*

Terms in Intertek Semko's Agreement on certification. Additional information in Appendix.

Certification Body Intertek Semko AB, Product Certification *Place* Kista - Stockholm

Signed Fredrik Wennersten *Date* 7 October 2003

Intertek ETL SEMKO

Appendix

Reference No. 310810

Technical data

Frequency (Hz) / Frekvens	50-60Hz
Input / Primär	100-4000A
Output / Sekundär	1-5A ; 5-15VA
Manufacturing site(s)	Mag Electric Co. West Mirdamad Blvd 2th Sq, Alborz Industrial City Qazvin ISLAMIC REPUBLIC OF IRAN

This certificate, which includes production control, is considered to constitute sufficient support for an EC Declaration of Conformity and CE marking of the product according to the Low Voltage Directive 73/23/EEC and 93/68/EEC.

Kista/Stockholm
7 October 2003

Fredrik Wennersten

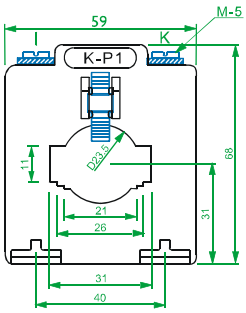
Intertek ETL SEMKO

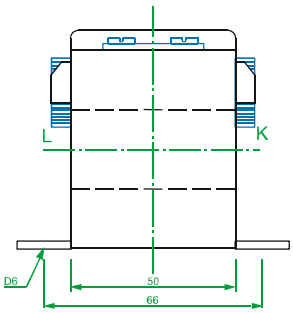
Page / 1 (1)

Current Transformer
Window – Type
0.72/ 3kV; 50 – 60 Hz

MAG ELECTRIC Co.

Type AL1





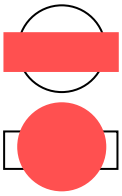
Window Sizes

Bars
30 × 10 or
20 × 10

Round conductors up to 23 ∅

Accessories on request:
Secondary terminal cover
Mounting feet

Dimensions in mm

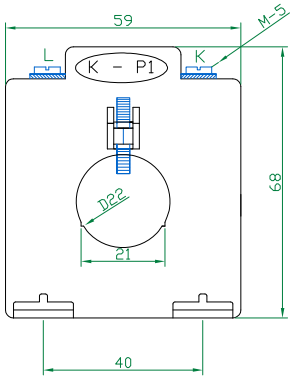


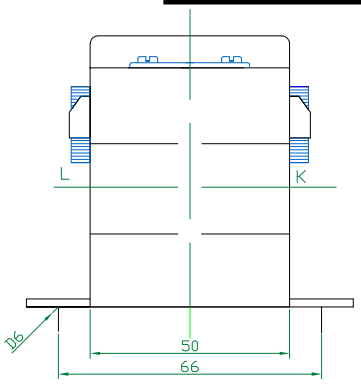
Secondary Primary A	1A,5A Class 0.5 Max(VA)	Class 1 Max(VA)	Class 3 Max(VA)
50 ★	5	5	7.5
75 ★	10	10	12.5
100	5	5	7.5
150	10	10	12.5
200	10	12.5	15
250	12.5	15	17.5
300	15	17.5	20
400	15	17.5	22.5
500	15	17.5	27.5
600	15	17.5	27.5

Other VA-Ratings, special ratios and CT's class 0.2 on request

★  **Only for cable conductors with primary 2 turns-for VA ≥ 1.25(CL0.5,1) VA ≥ 2.5 (CL 3)**

Type AL1N



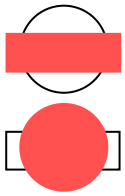


Window Sizes

Bars
20 × 10
Round conductors up to 22 ∅

Accessories on request:
Secondary terminal cover
Mounting feet

Dimensions in mm



Secondary Primary A	1A,5A Class 0.5 Max(VA)	Class 1 Max(VA)	Class 3 Max(VA)
50 ★	5	5	7.5
75 ★	10	10	12.5
100	5	5	7.5
150	10	10	12.5
200	10	12.5	15
250	12.5	15	17.5
300	15	17.5	20

Other VA-Ratings, special ratios and CT's class 0.2 on request

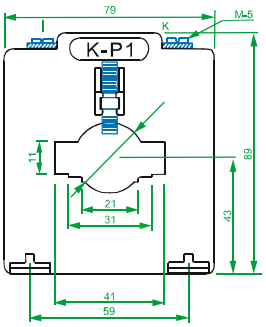
★  **Only for cable conductors with primary 2 turns-for VA ≥ 1.25(CL0.5,1) VA ≥ 2.5 (CL 3)**

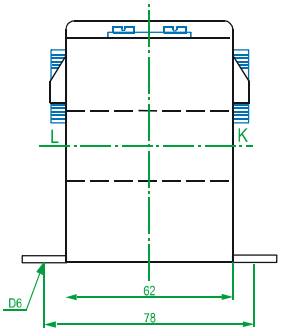
! It is recommended to select the minimum required VA, otherwise the CTs security factor and price will increase.

Current Transformer
Window – Type
0.72/ 3kV; 50 – 60 Hz

MAG ELECTRIC Co.

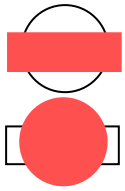
Type AL2





Window Sizes

Bars
40 × 10 or
30 × 10



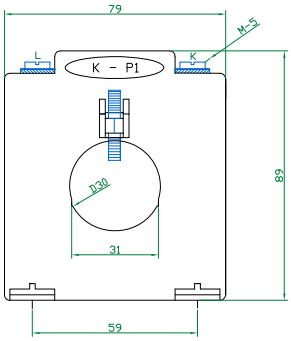
Round conductors up to 25 ∅

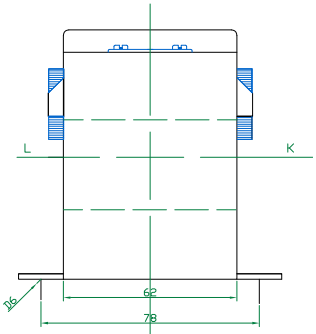
Accessories on request:
Secondary terminal cover
Mounting feet
Dimensions in mm

Secondary	1A,5A		
Primary A	Class 0.5 Max(VA)	Class 1 Max(VA)	Class 3 Max(VA)
200	5	7.5	10
250	7.5	10	12.5
300	10	12.5	15
400	25	30	37.5
500	30	35	45
600	30	35	50
800	35	40	50

Other VA-Ratings, special ratios and CT's class 0.2 on request

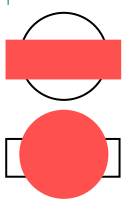
Type AL2 E





Window Sizes

Bars
30 × 10



Round conductors up to 32 ∅

Accessories on request:
Secondary terminal cover
Mounting feet

Dimensions in mm

Secondary	1A,5A		
Primary A	Class 0.5 Max(VA)	Class 1 Max(VA)	Class 3 Max(VA)
100	2.5	5	10
150	7.5	12.5	15
200	10	15	17.5
250	12.5	15	17.5
300	17.5	20	22.5
400	25	30	37.5
500	30	35	45
600	30	35	50

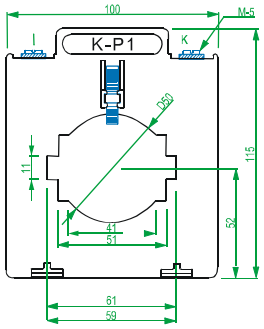
Other VA-Ratings, special ratios and CT's class 0.2 on request

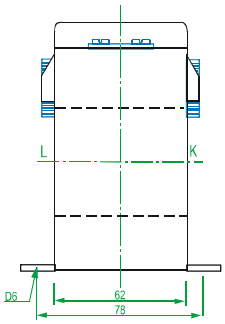
! It is recommended to select the minimum required VA, otherwise the CTs security factor and price will increase.

Current Transformer
Window – Type
0.72/ 3kV; 50 – 60 Hz

MAG ELECTRIC Co.

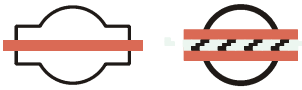
Type AL3



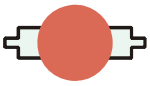


Window Sizes

Bars
60 × 10 or
2 × (50 × 10)



Round conductors up to 50 ∅



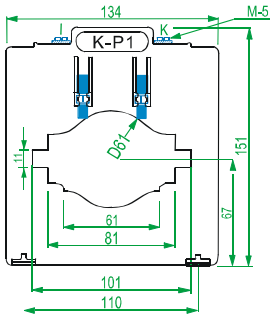
Accessories on request:
Secondary terminal cover
Mounting feet

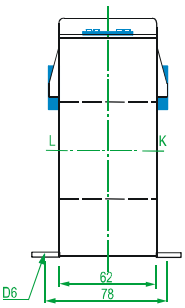
Dimensions in mm

Secondary / Primary A	1A,5A Class 0.5 Max(VA)	Class 1 Max(VA)	Class 3 Max(VA)
600	25	35	40
800	30	35	47.5
1000	35	40	47.5
1200	40	45	50
1500	45	50	52.5

Other VA-Ratings, special ratios and CT's class 0.2 on request

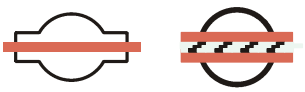
Type AL4



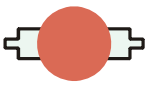


Window Sizes

Bars
100 × 10 or
2 × (80 × 10)



Round conductors up to 60 ∅



Accessories on request:
Secondary terminal cover
Mounting feet

Dimensions in mm

Secondary / Primary A	1A,5A Class 0.5 Max(VA)	Class 1 Max(VA)	Class 3 Max(VA)
1000	25	30	45
1200	30	40	47.5
1500	35	45	50
2000	40	45	52.5
2500	40	50	55

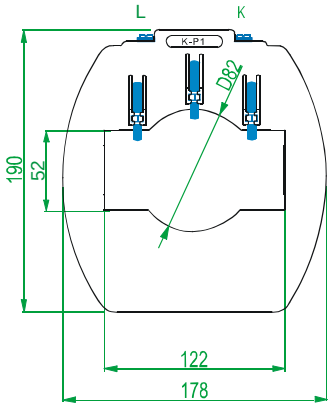
Other VA-Ratings, special ratios and CT's class 0.2 on request

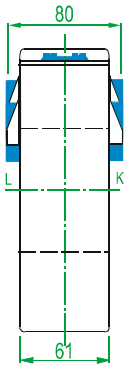
! It is recommended to select the minimum required VA, otherwise the CTs security factor and price will increase.

Current Transformer
Window – Type
0.72/ 3kV; 50 – 60 Hz

MAG ELECTRIC Co.

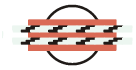
Type AL5



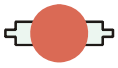


Window Sizes

Bars
3 × (120 × 10)



Round conductors up to 82 ∅



Accessories on request:
Secondary terminal cover

Secondary	1A,5A		
Primary A	Class 0.5 Max(VA)	Class 1 Max(VA)	Class 3 Max(VA)
1500	20	25	40
2000	25	30	45
2500	30	35	50
3000	35	40	52.5
4000	40	45	55

Other VA-Ratings, special ratios and CT's class 0.2 on request

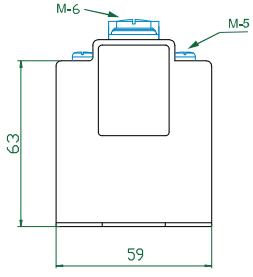
Dimensions in mm

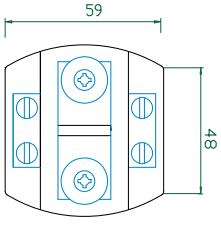
Type ALZ

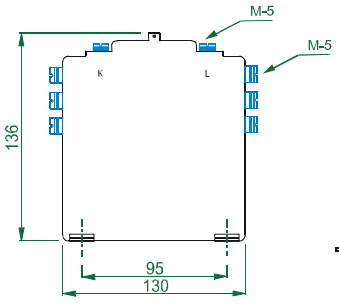
Normal or Summation Current Transformer

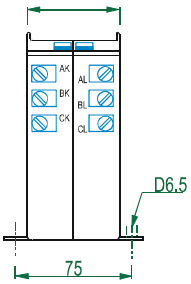
With screw – type terminal for cable socket

Type ALS









(Type ALZ) Technical Data			
I_N(A)		Secondary	
Primary	Type	Current	1A,5A
Current	ALZ	Class	0.5-3
	Normal	Output	
1 – 40		VA	1-20 VA

Supplied with mounting feet

Dimensions in mm

(Type ALS) Technical Data			
I_N(A)		Secondary	
Primary	Type	Current	1A,5A
Current	ALS	Class	0.5-3
2 to 6(5A,1A)	SUM	Output	
		VA	1-45 VA

! It is recommended to select the minimum required VA, otherwise the CTs security factor and price will increase.

Current Transformer
Window – Type
0.72/ 3kV; 50 – 60 Hz

MAG ELECTRIC Co.

Ring Type

Ring Type Current Transformers (Toroidal)

These kinds of current transformers are constructed in a range of burdens and accuracy classes for each transformer ratio (up to 6000 Amp), thereby enabling the designer to select a transformer suitable for measuring, protection and core balance applications.

The following information is required when ordering ring type measuring and protection current transformers according to IEC60044-1:

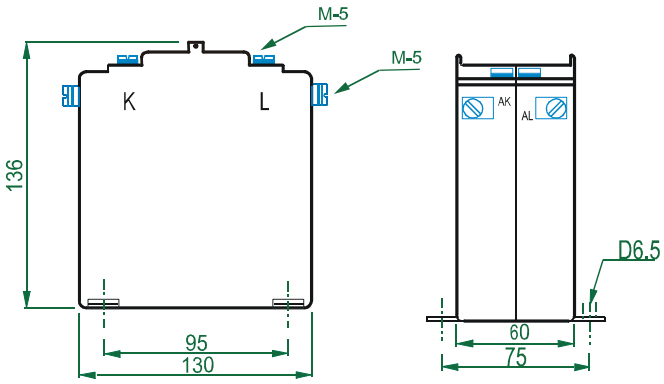
a- Transformer ratio
b- The VA burden
c- Class(measuring), class of accuracy and accuracy limit factor(ALF)
d- Minimum inner diameter

For core balance applications the following information is required:

a- Transformer ratio
b- Minimum inner diameter

For example (50/1; Cl. 3, 1VA, ∅ 130 mm)

ICT , IVT



Interpose / Matching Current and Voltage Transformers (ICT, IVT)

The transformers can also be used as interposing CT's for the galvanic separation of two measuring circuits. The following information is required when ordering **(ICT, IVT)** according to IEC60044-1, 2:

a- Transformer ratio (5/1, 1/5, 1/1, 3/4, …),(400/100 , 400√3/100√3, 220/110,…)
b- The VA burden
c- Class(measuring) (1, 1+3P , 0.5 , 0.5 + 3P, class of accuracy and accuracy limit factor(ALF) (5P10, 10P10 , …)

LOW VOLTAGE CURRENT TRANSFORMERS TYPE AL

STANDARD

Current transformers type AL are manufactured and tested in accordance with

IEC 60044-1
VDE 0414 parts **1,2**

APPLICATIONS

Instrument current transformers type AL are key components in measuring systems.

They are used to transform high primary currents for instruments such as ammeters and kWh meters, protection relays, and more.

Current transformers protect delicate instrument against high overload currents and also provide insulation of the measuring circuits from the supply voltage.

Current transformers type AL are suitable for sliding in busbars or cables according to the sketch, listed for each type.

CONSTRUCTION

Current transformers type AL are enclosed in special housing made of polycarbonate, which is resistant to leakage current and temperature up to 135 ^{o}C .

The connection terminals are nickel-plated brass and are vibration proof to ensure good electrical connection.

Each terminal has two bolts enabling easy changing of instruments with open circuiting the current transfomer.

TECHNICAL SPECIFICATION

Highest system voltage……..720 V
Test voltage……3000V for 1min
Rated primary current……1-6000A
Rated secondary current (typically)……..5A,1A
Rated frequency…….50/60Hz
Insulation class……...E
Rated output…….…..see tables for each type
Accuracy limit factor……..FS5 and FS10 or P5…P20
Rated continuous current…….1.2 × I_N
Rated thermal current…….> 60 × I_N

REMARKS

Current trasformers with following particulars can supplied upon request:
-Primary and secondary currents other than listed for each;
-Output rating other than listed for each type;
-Secondary tapping;
-Primary bars;
-Tropic design;

ORDER SPECIFICATION

-Quantity
-Type
-Transforming ratio
-Accuracy class
- Accessories (Mounting feet, Secondary terminal cover)

STANDARD TRANSFORMER
RATIO ERROR ±0.005% , PHASE ERROR ±0.5 MINUTES

A PART OF TOROIDAL WINDING MACHINE

LOW VOLTAGE TEST PANEL

INSTRUMENT

CURRENT & VOLTAGE

TRANSFORMERS

3.6 Up to 36 kV

MAG ELECTRIC Co.

Manufacturer of Low and Medium Voltage Instrument Transformers with the Cooperation and Manufacturing License of SIEMENS and MESSWANDLER-BAU (MWB) of Germany

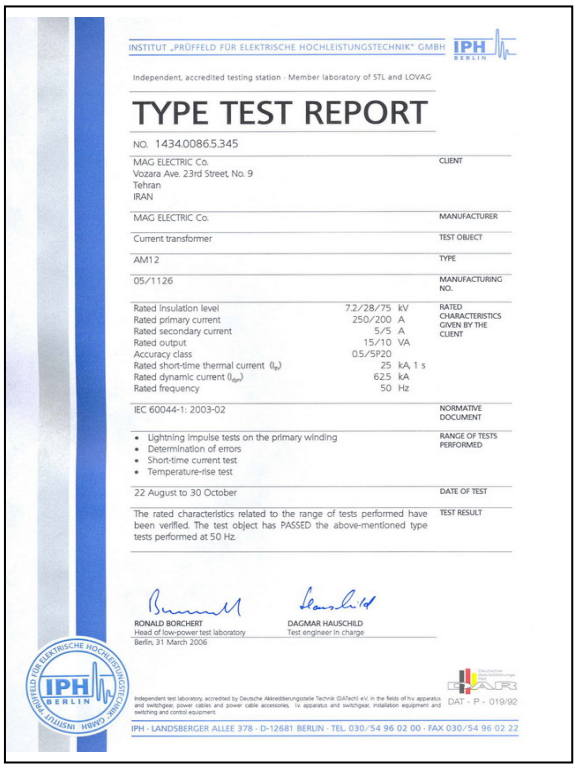
ISO 9001 Registered Firm CISQ IMQ CSQ

CERTIFIED IQNet QUALITY SYSTEM

40th ANNIVERSARY 2013

SIEMENS KEMA

THE TYPE TEST CONFIRMATION FROM INDEPENDENT ACCREDITED IPH TEST LABORATORY IN GERMANY



INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH

Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1434.0086.5.345

MAG ELECTRIC Co. Vozara Ave. 23rd Street, No. 9 Tehran IRAN		CLIENT
MAG ELECTRIC Co.		MANUFACTURER
Current transformer		TEST OBJECT
AM12		TYPE
05/1126		MANUFACTURING NO.
Rated insulation level	7.2/28/75 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary current	250/200 A	
Rated secondary current	5/5 A	
Rated output	15/10 VA	
Accuracy class	0.5/5P20	
Rated short-time thermal current (I_{th})	25 kA, 1 s	
Rated dynamic current (I_{dyn})	62.5 kA	
Rated frequency	50 Hz	
IEC 60044-1: 2003-02		NORMATIVE DOCUMENT
• Lightning impulse tests on the primary winding • Determination of errors • Short-time current test • Temperature-rise test		RANGE OF TESTS PERFORMED
22 August to 30 October		DATE OF TEST
The rated characteristics related to the range of tests performed have been verified. The test object has PASSED the above-mentioned type tests performed at 50 Hz.		TEST RESULT

RONALD BORCHERT
Head of low-power test laboratory

DAGMAR HAUSCHILD
Test engineer in charge

Berlin, 31 March 2006

Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Technik (DATech) e.V. in the fields of h.v. apparatus and switchgear, power cables and power cable accessories, l.v. apparatus and switchgear, installation equipment and switching and control equipment.

DAT - P - 019/92

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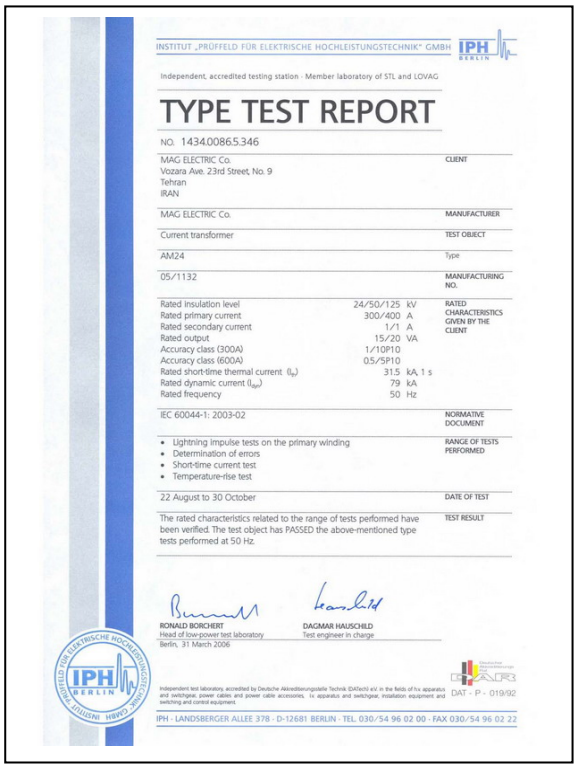
AM12



INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH

Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1434.0086.5.346

MAG ELECTRIC Co. Vozara Ave. 23rd Street, No. 9 Tehran IRAN		CLIENT
MAG ELECTRIC Co.		MANUFACTURER
Current transformer		TEST OBJECT
AM24		Type
05/1132		MANUFACTURING NO.
Rated insulation level	24/50/125 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary current	300/400 A	
Rated secondary current	1/1 A	
Rated output	15/20 VA	
Accuracy class (300A)	1/10P10	
Accuracy class (600A)	0.5/5P10	
Rated short-time thermal current (I_{th})	31.5 kA, 1 s	
Rated dynamic current (I_{dyn})	79 kA	
Rated frequency	50 Hz	
IEC 60044-1: 2003-02		NORMATIVE DOCUMENT
• Lightning impulse tests on the primary winding • Determination of errors • Short-time current test • Temperature-rise test		RANGE OF TESTS PERFORMED
22 August to 30 October		DATE OF TEST
The rated characteristics related to the range of tests performed have been verified. The test object has PASSED the above-mentioned type tests performed at 50 Hz.		TEST RESULT

RONALD BORCHERT
Head of low-power test laboratory

DAGMAR HAUSCHILD
Test engineer in charge

Berlin, 31 March 2006

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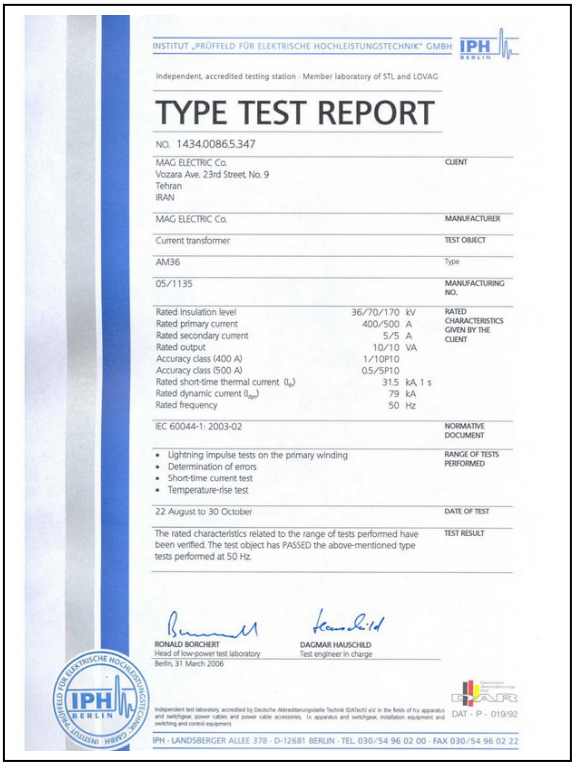
AM24



INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH

Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1434.0086.5.347

MAG ELECTRIC Co. Vozara Ave. 23rd Street, No. 9 Tehran IRAN		CLIENT
MAG ELECTRIC Co.		MANUFACTURER
Current transformer		TEST OBJECT
AM36		Type
05/1135		MANUFACTURING NO.
Rated insulation level	36/70/170 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary current	400/500 A	
Rated secondary current	5/5 A	
Rated output	10/10 VA	
Accuracy class (400 A)	1/10P10	
Accuracy class (500 A)	0.5/5P10	
Rated short-time thermal current (I_{th})	31.5 kA, 1 s	
Rated dynamic current (I_{dyn})	79 kA	
Rated frequency	50 Hz	
IEC 60044-1: 2003-02		NORMATIVE DOCUMENT
• Lightning impulse tests on the primary winding • Determination of errors • Short-time current test • Temperature-rise test		RANGE OF TESTS PERFORMED
22 August to 30 October		DATE OF TEST
The rated characteristics related to the range of tests performed have been verified. The test object has PASSED the above-mentioned type tests performed at 50 Hz.		TEST RESULT

RONALD BORCHERT
Head of low-power test laboratory

DAGMAR HAUSCHILD
Test engineer in charge

Berlin, 31 March 2006

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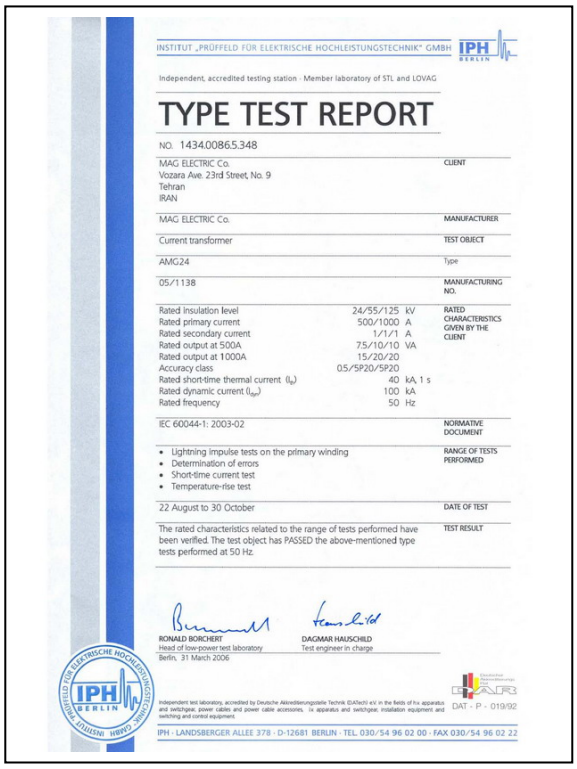
AM36

THE TYPE TEST CONFIRMATION FROM INDEPENDENT ACCREDITED IPH TEST LABORATORY IN GERMANY



INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH

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TYPE TEST REPORT

NO. 1434.0086.5.348

MAG ELECTRIC Co. Vozara Ave. 23rd Street, No. 9 Tehran IRAN		CLIENT
MAG ELECTRIC Co.		MANUFACTURER
Current transformer		TEST OBJECT
AMG24		Type
05/1138		MANUFACTURING NO.
Rated insulation level	24/55/125 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary current	500/1000 A	
Rated secondary current	1/1/1 A	
Rated output at 500A	7.5/10/10 VA	
Rated output at 1000A	15/20/20	
Accuracy class	0.5/5P20/5P20	
Rated short-time thermal current (I_{th})	40 kA, 1 s	
Rated dynamic current (I_{dyn})	100 kA	
Rated frequency	50 Hz	
IEC 60044-1: 2003-02		NORMATIVE DOCUMENT
• Lightning impulse tests on the primary winding • Determination of errors • Short-time current test • Temperature-rise test		RANGE OF TESTS PERFORMED
22 August to 30 October		DATE OF TEST
The rated characteristics related to the range of tests performed have been verified. The test object has PASSED the above-mentioned type tests performed at 50 Hz.		TEST RESULT

RONALD BORCHERT
Head of low-power test laboratory
Berlin, 31 March 2006

DAGMAR HAUSCHILD
Test engineer in charge

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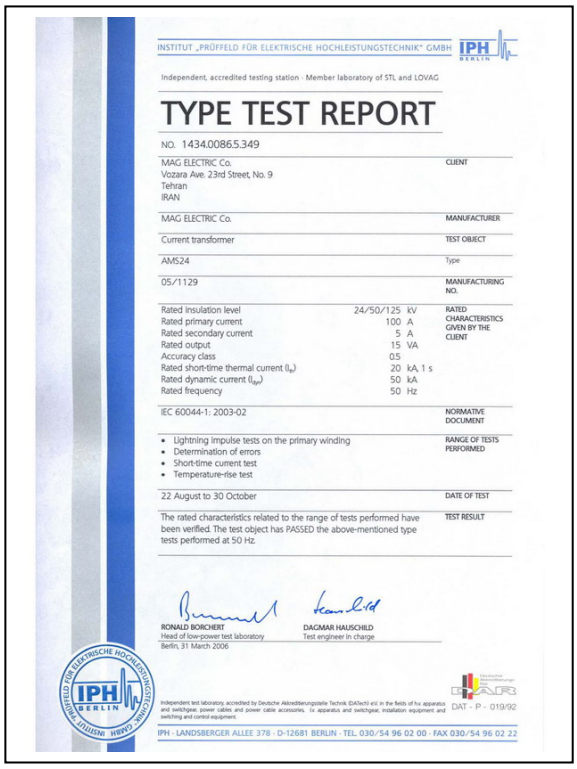
AMG24



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Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1434.0086.5.349

MAG ELECTRIC Co. Vozara Ave. 23rd Street, No. 9 Tehran IRAN		CLIENT
MAG ELECTRIC Co.		MANUFACTURER
Current transformer		TEST OBJECT
AMS24		Type
05/1129		MANUFACTURING NO.
Rated insulation level	24/50/125 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary current	100 A	
Rated secondary current	5 A	
Rated output	15 VA	
Accuracy class	0.5	
Rated short-time thermal current (I_{th})	20 kA, 1 s	
Rated dynamic current (I_{dyn})	50 kA	
Rated frequency	50 Hz	
IEC 60044-1: 2003-02		NORMATIVE DOCUMENT
• Lightning impulse tests on the primary winding • Determination of errors • Short-time current test • Temperature-rise test		RANGE OF TESTS PERFORMED
22 August to 30 October		DATE OF TEST
The rated characteristics related to the range of tests performed have been verified. The test object has PASSED the above-mentioned type tests performed at 50 Hz.		TEST RESULT

RONALD BORCHERT
Head of low-power test laboratory
Berlin, 31 March 2006

DAGMAR HAUSCHILD
Test engineer in charge

DAT - P - 019/92

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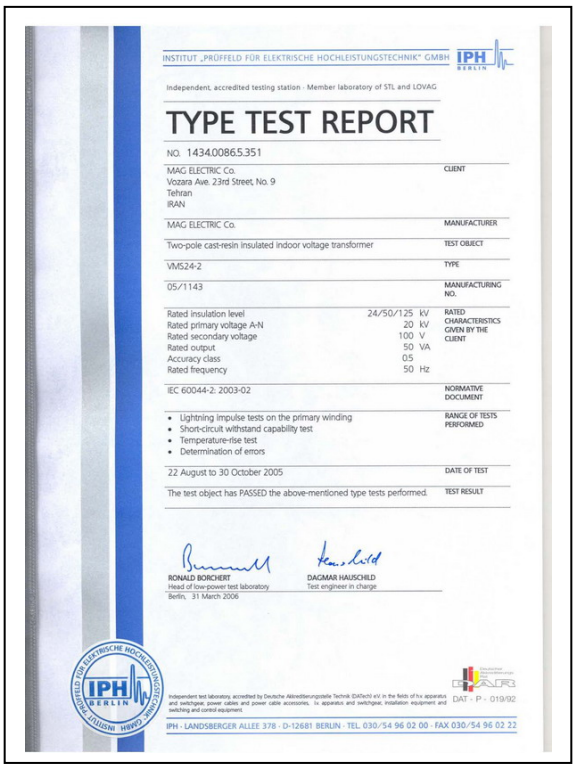
AMS24



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TYPE TEST REPORT

NO. 1434.0086.5.351

MAG ELECTRIC Co. Vozara Ave. 23rd Street, No. 9 Tehran IRAN		CLIENT
MAG ELECTRIC Co.		MANUFACTURER
Two-pole cast-resin insulated indoor voltage transformer		TEST OBJECT
VMS24-2		TYPE
05/1143		MANUFACTURING NO.
Rated insulation level	24/50/125 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary voltage A-N	20 kV	
Rated secondary voltage	100 V	
Rated output	50 VA	
Accuracy class	0.5	
Rated frequency	50 Hz	
IEC 60044-2: 2003-02		NORMATIVE DOCUMENT
• Lightning impulse tests on the primary winding • Short-circuit withstand capability test • Temperature-rise test • Determination of errors		RANGE OF TESTS PERFORMED
22 August to 30 October 2005		DATE OF TEST
The test object has PASSED the above-mentioned type tests performed.		TEST RESULT

RONALD BORCHERT
Head of low-power test laboratory
Berlin, 31 March 2006

DAGMAR HAUSCHILD
Test engineer in charge

DAT - P - 019/92

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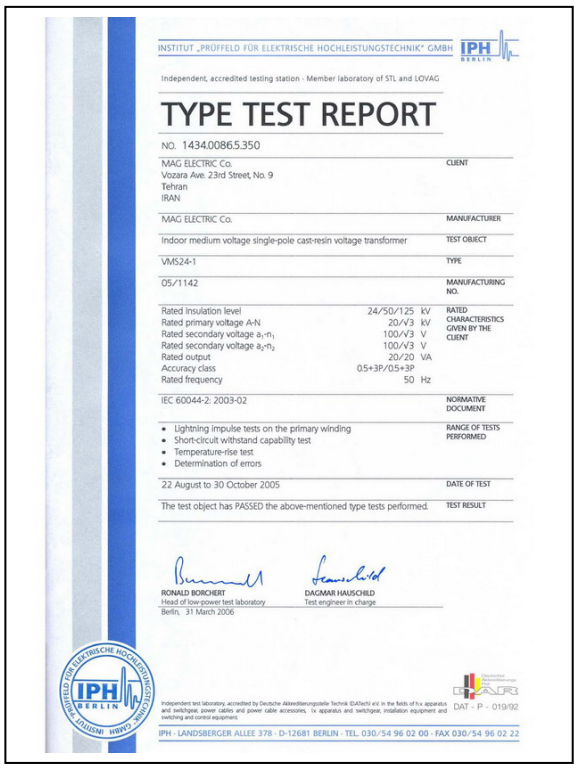
VMS24-2



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Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1434.0086.5.350

MAG ELECTRIC Co. Vozara Ave. 23rd Street, No. 9 Tehran IRAN		CLIENT
MAG ELECTRIC Co.		MANUFACTURER
Indoor medium voltage single-pole cast-resin voltage transformer		TEST OBJECT
VMS24-1		TYPE
05/1142		MANUFACTURING NO.
Rated insulation level	24/50/125 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary voltage A-N	20/√3 kV	
Rated secondary voltage a_1-n_1	100/√3 V	
Rated secondary voltage a_2-n_2	100/√3 V	
Rated output	20/20 VA	
Accuracy class	0.5+3P/0.5+3P	
Rated frequency	50 Hz	
IEC 60044-2: 2003-02		NORMATIVE DOCUMENT
• Lightning impulse tests on the primary winding • Short-circuit withstand capability test • Temperature-rise test • Determination of errors		RANGE OF TESTS PERFORMED
22 August to 30 October 2005		DATE OF TEST
The test object has PASSED the above-mentioned type tests performed.		TEST RESULT

RONALD BORCHERT
Head of low-power test laboratory
Berlin, 31 March 2006

DAGMAR HAUSCHILD
Test engineer in charge

DAT - P - 019/92

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VMS24-1

THE NEW TYPE TEST CONFIRMATION FROM INDEPENDENT ACCREDITED E.P.I.L. TEST LABORATORY IN IRAN

Electrical Power Industries Laboratories Co.(J.S.)

Test report : 2360 Page 1 of 13 LQF-510-02

TEST REPORT

Project No.: TI-1413-I60044

Tested Product: Voltage Transformer

Model/Type	: VMS12-1
Serial Number	: 1391.8 0159 04 0001
Rated Ratio:	: 6300/√3/110/√3/110/√3/110/√3
Over Voltage Factor:	: 1.2
Rated Burden	: 20 VA

Manufactured By: Mag Electric.

Address: Ghazvin, Alborz Industrial City.

Tested according to: IEC 60044-2

No. Pages	13
Issue date	22-Jan-2013

Prepared: Test & Inspection Engineer K. Naqshi

Verified: Head of HV lab. R. Akbari

Approved: Vice President of CEO S.M. Mirsadri

Engineering Deputy of Test and Inspection Prof. B. Vahidi

This test report does not include an assessment of the manufacturer's production. Conformity of the production with tested sample is not the responsibility of EPIL.

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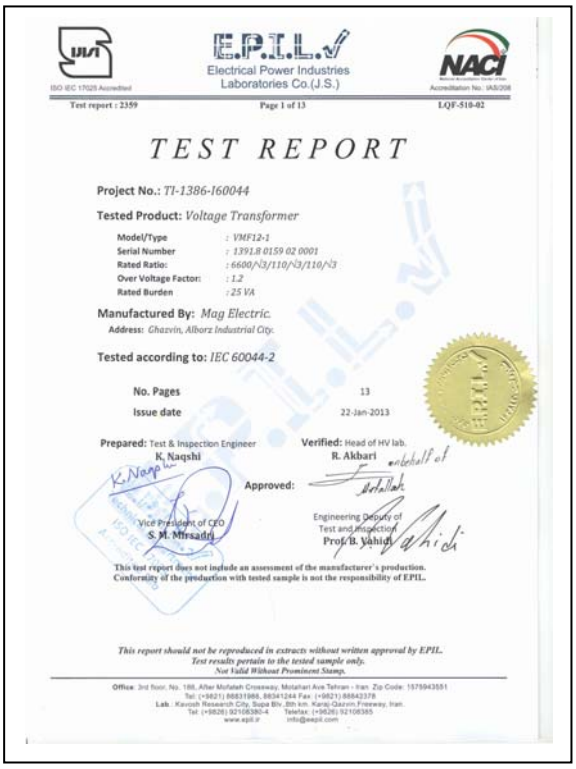
Lab.: Kavosh Research City, Supa Blv.,8th km. Karaj-Qazvin Freeway, Iran.
Tel: (+9826) 92108380-4 Telefax: (+9826) 92108385
www.epil.ir info@epil.com

VMS12-1



Electrical Power Industries Laboratories Co.(J.S.)

Test report : 2359 Page 1 of 13 LQF-510-02

TEST REPORT

Project No.: TI-1386-I60044

Tested Product: Voltage Transformer

Model/Type	: VMF12-1
Serial Number	: 1391.8 0159 02 0001
Rated Ratio:	: 6600/√3/110/√3/110/√3
Over Voltage Factor:	: 1.2
Rated Burden	: 25 VA

Manufactured By: Mag Electric.

Address: Ghazvin, Alborz Industrial City.

Tested according to: IEC 60044-2

No. Pages	13
Issue date	22-Jan-2013

Prepared: Test & Inspection Engineer K. Naqshi

Verified: Head of HV lab. R. Akbari

Approved: Vice President of CEO S.M. Mirsadri

Engineering Deputy of Test and Inspection Prof. B. Vahidi

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www.epil.ir info@epil.com

VMF12-1

Electrical Power Industries Laboratories Co.(J.S.)

Test report : 2361 Page 1 of 13 LQF-510-02

TEST REPORT

Project No.: TI-1414-I60044

Tested Product: Voltage Transformer

Model/Type	: VMF24-1
Serial Number	: 1391.8 0159 01 0001
Rated Ratio:	: 20000/√3/100/√3/100/√3/110/√3
Over Voltage Factor:	: 1.2
Rated Burden	: 30 VA

Manufactured By: Mag Electric.

Address: Ghazvin, Alborz Industrial City.

Tested according to: IEC 60044-2

No. Pages	13
Issue date	22-Jan-2013

Prepared: Test & Inspection Engineer K. Naqshi

Verified: Head of HV lab. R. Akbari

Approved: Vice President of CEO S.M. Mirsadri

Engineering Deputy of Test and Inspection Prof. B. Vahidi

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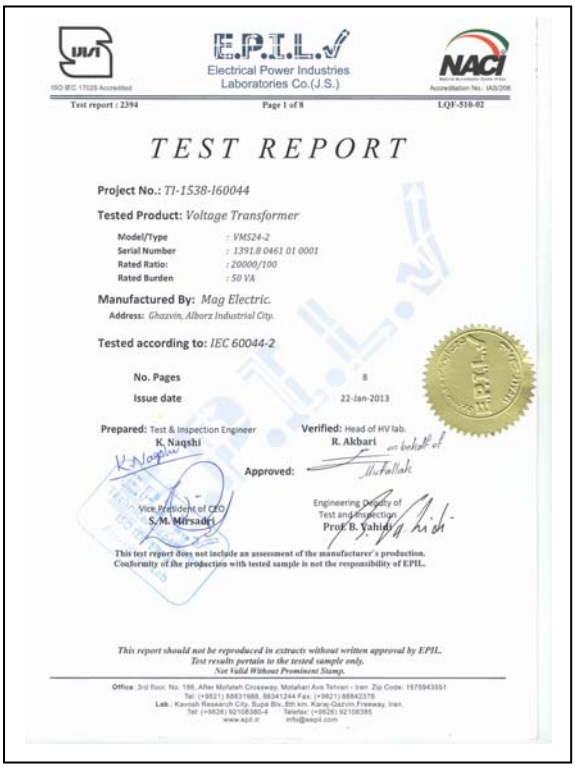
VMF24-1

THE NEW TYPE TEST CONFIRMATION FROM INDEPENDENT ACCREDITED E.P.I.L. TEST LABORATORY IN IRAN



Electrical Power Industries Laboratories Co.(J.S.)

Test report : 2394 Page 1 of 8 LQF-510-02

TEST REPORT

Project No.: TI-1538-I60044

Tested Product: Voltage Transformer

Model/Type : VMS24-2
Serial Number : 1391.8 0461 01 0001
Rated Ratio: : 20000/100
Rated Burden : 50 VA

Manufactured By: Mag Electric.
Address: Ghazvin, Alborz Industrial City.

Tested according to: IEC 60044-2

No. Pages 8
Issue date 22-Jan-2013

Prepared: Test & Inspection Engineer K. Naqshi
Verified: Head of HV lab. R. Akbari
Approved: Vice President of CEO S.M. Mirsadri
Engineering Deputy of Test and Inspection Prof. B. Vahidi

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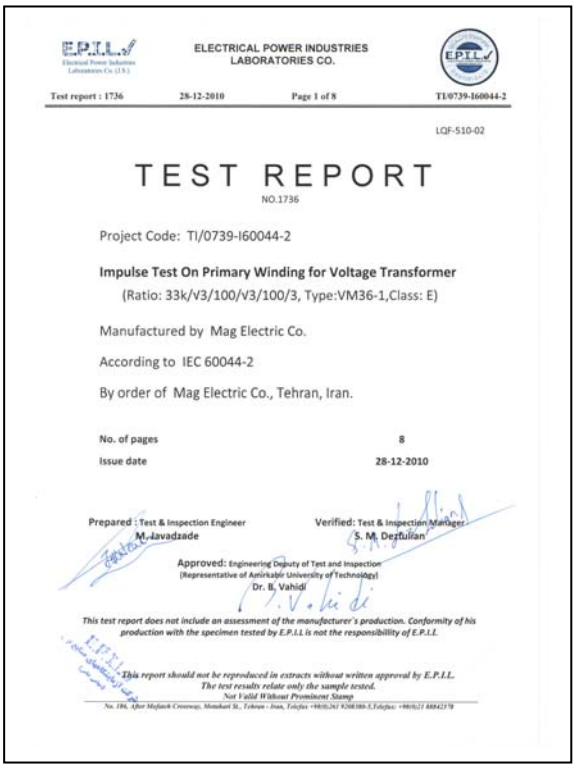
VMS24-2



ELECTRICAL POWER INDUSTRIES LABORATORIES CO.

Test report : 1736 28-12-2010 Page 1 of 8 TI/0739-I60044-2

LQF-510-02

TEST REPORT

NO.1736

Project Code: TI/0739-I60044-2

Impulse Test On Primary Winding for Voltage Transformer
(Ratio: 33k/√3/100/√3/100/3, Type:VM36-1,Class: E)

Manufactured by Mag Electric Co.

According to IEC 60044-2

By order of Mag Electric Co., Tehran, Iran.

No. of pages 8
Issue date 28-12-2010

Prepared : Test & Inspection Engineer M. Javadzade
Verified: Test & Inspection Manager S. M. Dezfulian
Approved: Engineering Deputy of Test and Inspection (Representative of Amirkabir University of Technology) Dr. B. Vahidi

This test report does not include an assessment of the manufacturer's production. Conformity of his production with the specimen tested by E.P.I.L is not the responsibility of E.P.I.L.

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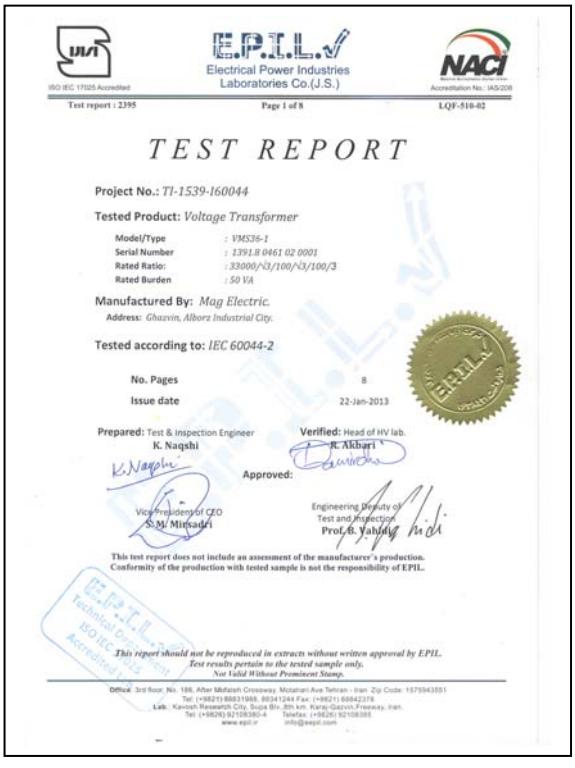
No. 186, After Mofateh Crossway, Motahari St., Tehran - Iran, Telefax: +98(0)21 88842378

VM36-1



Electrical Power Industries Laboratories Co.(J.S.)

Test report : 2395 Page 1 of 8 LQF-510-02

TEST REPORT

Project No.: TI-1539-I60044

Tested Product: Voltage Transformer

Model/Type : VMS36-1
Serial Number : 1391.8 0461 02 0001
Rated Ratio: : 33000/√3/100/√3/100/3
Rated Burden : 50 VA

Manufactured By: Mag Electric.
Address: Ghazvin, Alborz Industrial City.

Tested according to: IEC 60044-2

No. Pages 8
Issue date 22-Jan-2013

Prepared: Test & Inspection Engineer K. Naqshi
Verified: Head of HV lab. R. Akbari
Approved: Vice President of CEO S.M. Mirsadri
Engineering Deputy of Test and Inspection Prof. B. Vahidi

This test report does not include an assessment of the manufacturer's production. Conformity of the production with tested sample is not the responsibility of EPIL.

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VMS36-1

MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument current Transformers, indoor, Block Type , Cast-Resin Insulated

Technical data

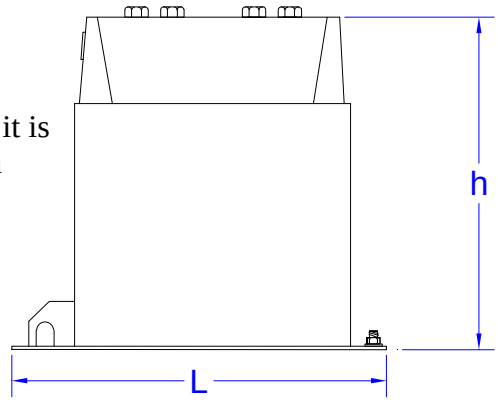
Type		AM12	AMN12	AMB12	AMG12
Highest voltage for equipment	kV	3.6	7.2	12	
Power frequency withstand test voltage, 1 minute	kV	10	20	28	
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40	60	75	
Rated frequency	Hz	50/60	50/60	50/60	50/60
Rated primary current	A	5-1250	5-3150	5-1250	5-3150
Primary reconnection★ 1:2	A	------	2 × 100	------	2 × 100
Secondary current	A	5 or 1	5 or 1	5 or 1	5 or 1
Max. rated continuous thermal current × I_n	A	1.2	1.2	1.2	1.2
Rated short time thermal current I_{th} in1 sec.(100-1000) × I_n	Max.kA	60	60	60	60
Rated dynamic current I_{dyn} = 2.5 × I_{th}	Max.kA	120	120	120	120
Max. number of cores (Depends on burden , accuracy class , Ith value)		3	3	4	4
Accuracy class measuring / protection		0.2-0.5-1/5P -10P			
Rated output (measuring / protection)		5-30VA/1-30 VA			
Instrument security factor (measuring; FS5,FS10)/ Accuracy limit factor (protection; P5-P30)					

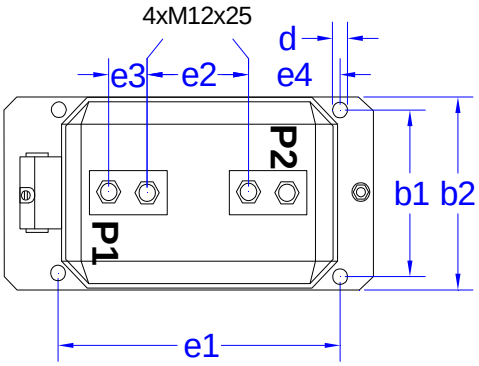
On Request:

Constructions with capacitive layer

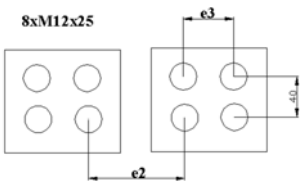
★ Change over: with multi-purpose transformers it is possible to work with several primary currents. In principle, the change over can be made from the primary as well as from the secondary side. (Secondary tapping; for instance 800-1000/5A)

AM12-AMN12-AMB12- AMG12





$I_{Primary} \leq 1250$ A



$I_{Primary} \geq 1500$ A

Type	AM12	AMN12	AMB12	AMG12
e1	270	280	370	380
e2	120	120	120	120
e3	32	32	32	32
e4	75	80	125	130
L	342	362	442	462
b1	125	148	125	148
b2	148	178	148	178
h	225	285	225	285
d	11	14	14	14

Dimensions in mm

MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument current Transformers, indoor, Block Type, Cast-Resin Insulated

Technical data

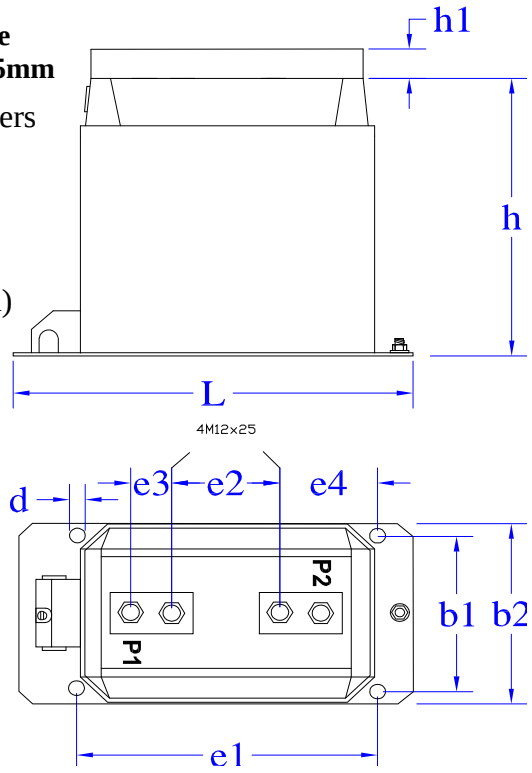
Type		AMS24	AM24-R	AMG24
Highest voltage for equipment	kV	24	24	24
Power frequency withstand test voltage, 1 minute	kV	50	50	50
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	125	125	125
Rated frequency	Hz	50/60	50/60	50/60
Rated primary current	A	5-400	5-2500	5-2500
Primary reconnection★ 1:2	A	2 × 100	2 × 100	2 × 100
Secondary current	A	5 or 1	5 or 1	5 or 1
Max. rated continuous thermal current × I_n	A	1.2	1.2	1.2
Rated short time thermal current I_{th} in1 sec.(100-1000) × I_n	Max.kA	40	60	60
Rated dynamic current I_{dyn} = 2.5 × I_{th}	Max.kA	100	120	120
Max. number of cores (Depends on burden , accuracy class , Ith value)		1	3	4
Accuracy class measuring / protection		0.2-0.5-1/5P -10P		
Rated output (measuring / protection)		5-30VA/1-30 VA		
Instrument security factor (measuring; FS5, FS10)/ Accuracy limit factor (protection; P5-P30)				

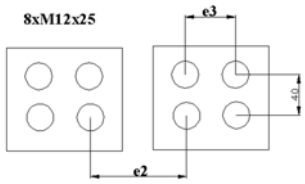
On Request:

Constructions with capacitive layer
Ribs on the top for increasing creepage distance
(AMS24-R, AM24-R,AMG24-R) Ribs height 35mm

★ Change over: with multi-purpose transformers it is possible to work with several primary currents. In principle, the change over can be made from the primary as well as from the secondary side.
(Secondary tapping; for instance 800-1500/5A)

AMS24-AM24-R-AMG24





Type	AMS24	AM24-R	AMG24
e1	210	280	380
e2	120	120	120
e3	-	32	32
e4	45	80	130
L	292	362	462
b1	148	148	148
b2	178	178	178
h	290	285	285
d	14	14	14
h1	35	35	35

Dimensions in mm

$I_{Primary} \leq 1250$ A

$I_{Primary} \geq 1500$ A

MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument current Transformers, indoor, Block Type, Cast-Resin Insulated

Technical data

Type		AMN36	AMG36
Highest voltage for equipment	kV	36	36
Power frequency withstand test voltage, 1 minute	kV	70	70
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	170	170
Rated frequency	Hz	50/60	50/60
Rated primary current	A	5-1500	5-2000
Secondary current	A	5 or 1	5 or 1
Max. rated continuous thermal current × I_n	A	1.2	1.2
Rated short time thermal current I_{th} in 1 Sec. Min(100 ×I_n)	Max.kA	60	60
Rated dynamic current I_{dyn} = 2.5 × I_{th}	Max.kA	120	120
Max. number of cores (Depends on burden , accuracy class , Ith value)		3	4
Accuracy class measuring / protection		0.2-0.5-1/5P -10P	
Rated output		5-30 VA/1-30 VA	
Instrument security factor (measuring; FS5,FS10)/ Accuracy limit factor (protection; P5-P30)			

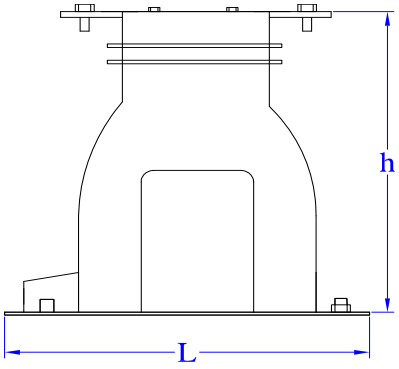
On Request:

Constructions with capacitive layer

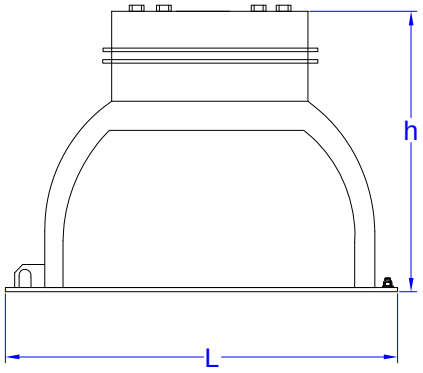
★ Change over: with multi-purpose transformers it is possible to work with several primary currents. In principle, the change over can be made from the primary as well as from the secondary side.
(Secondary tapping; for instance 800-1000/5A)

Type	AMN36	AMG36
e1	340	450
e2	220	120
e3	32	32
e4	60	165
L	438	548
b1	190	190
b2	220	220
h	390	390
d	14	14

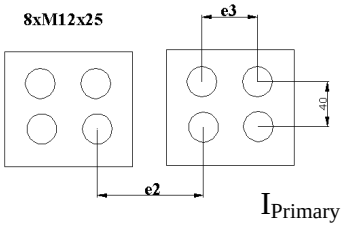
AMN36



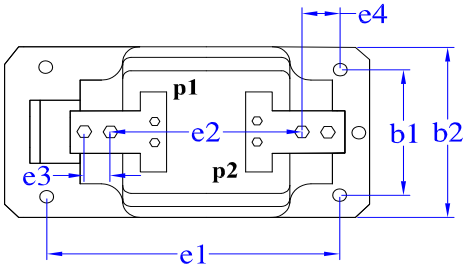
AMG36

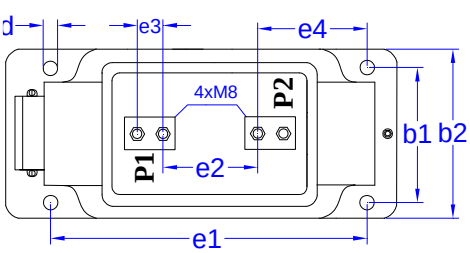


Dimensions in mm



$I_{Primary} \geq 1500$ A





$I_{Primary} \leq 1250$ A

MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument current Transformers, indoor, Block Type, Cast-Resin Insulated

Technical data

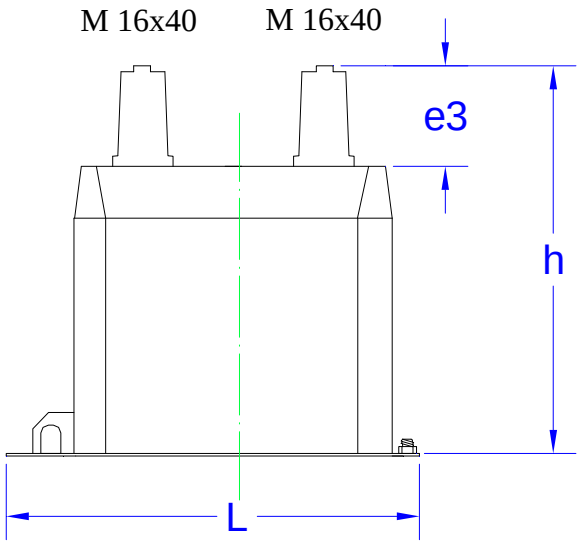
Type		AMI12	AMI24
Highest voltage for equipment	kV	3.6,7.2,12	24
Power frequency withstand test voltage, 1 minute	kV	10,20,28	50
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40,60,75	125
Rated frequency	Hz	50/60	50/60
Rated primary current	A	5-300	5-300
Secondary current	A	5 or 1	5 or 1
Max. rated continuous thermal current × I_n	A	1.2	1.2
Rated short time thermal current I_{th} in 1 Sec. Min(100 ×I_n)	Max.kA	30	30
Rated dynamic current I_{dyn} = 2.5 × I_{th}	Max.kA	75	75
Max. number of cores		2	2
Accuracy class measuring / protection	0.2-0.5-1/5P -10P		
Rated output	1-30 VA		
Instrument security factor (measuring; FS5,FS10)/ Accuracy limit factor (protection; P5-P30)			

On Request:

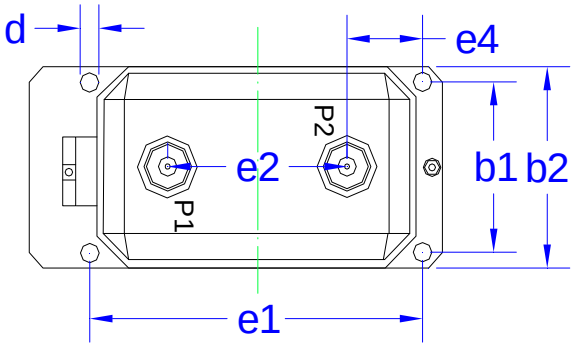
Constructions with capacitive layer

★ Change over: The change over can only be made from the secondary side.
(Secondary tapping; for instance 80-100/5A)

AMI Series : Suitable for polluted aria (high humidity,…)



Type	AMI12	AMI24
e1	280	280
e2	120	120
e3	102	102
e4	80	80
L	362	362
b1	148	148
b2	178	178
h	347	347
d	14	14



Dimensions in mm

MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument current Transformers, indoor, Ring Type, Cast-Resin Insulated

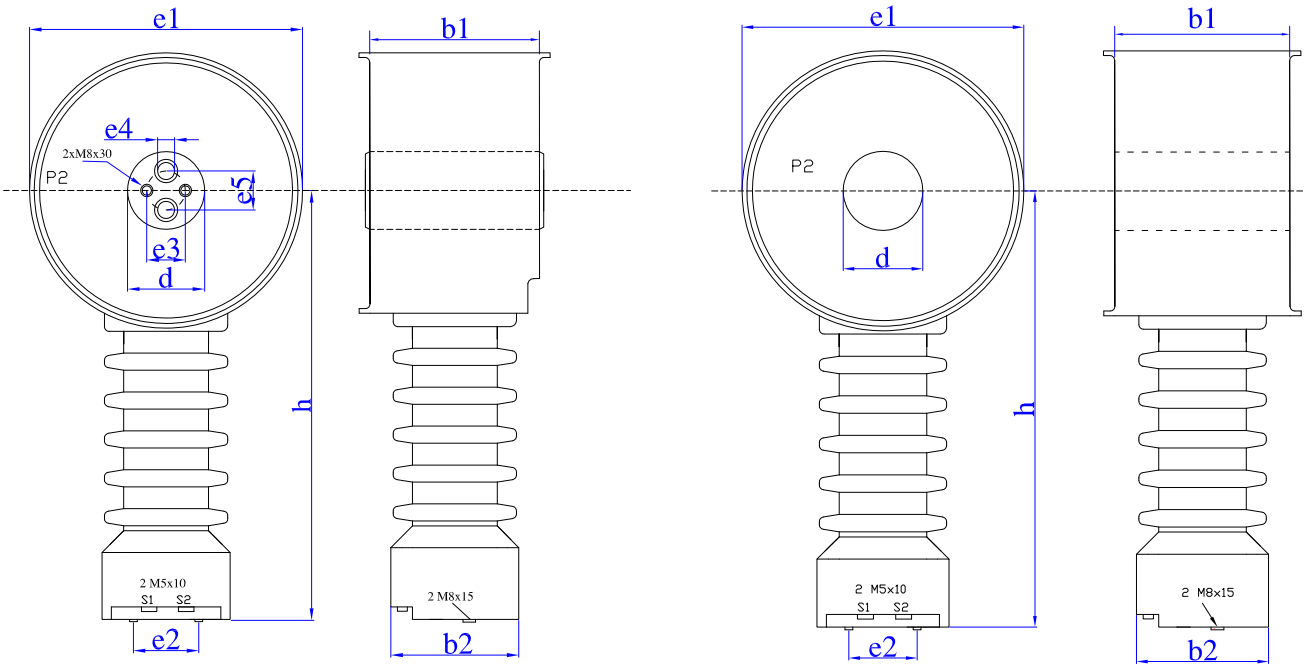
Technical data

Type		AMC24	AMW24
Highest voltage for equipment	kV	24	24
Power frequency withstand test voltage, 1 minute	kV	50	50
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	125	125
Rated frequency	Hz	50/60	50/60
Rated primary current	A	50-400	50-400
Secondary current	A	5 or 1	5 or 1
Max. rated continuous thermal current × I_n	A	1.2	1.2
Rated short time thermal current I_{th} in 1 Sec. Min(100 ×I_n)	Max.kA	30	30
Rated dynamic current I_{dyn} = 2.5 × I_{th}	Max.kA	75	75
Max. number of cores		1	1
Accuracy class protection		10P	
Rated output		1-5 VA	
Accuracy limit factor		(protection; P10)	

Type	AMC24	AMW24
e1	186	186
e2	35	35
e3	25	-
e4	9	-
b1	110	110
b2	80	80
h	290	290
d	48	48

AMC : Suitable for installation on Circuit Breaker
-The following information is required when ordering :
1- Circuit Breaker – Brand (Merlan , Pars swith , ABB ,…)
2- Dimension e5
3- Horizontal or Vertical position of e5

Dimensions in mm



MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument current Transformers, indoor, Ring Type , Cast-Resin Insulated

Technical data

Type		AMD12	AMDL12	AMD24	AMDL24
Highest voltage for equipment	kV	3.6 , 7.2 , 12		24	24
Power frequency withstand test voltage, 1 minute	kV	10 , 20 , 28		50	50
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40 , 60 , 75		125	125
Rated frequency	Hz	50/60	50/60	50/60	50/60
Max. Rated primary current	A	4000	4000	4000	4000
Primary reconnection* 1:2	A	------	------	------	------
Secondary current	A	5 or 1	5 or 1	5 or 1	5 or 1
Max. rated continuous thermal current × I_n	A	1.2	1.2	1.2	1.2
Rated short time thermal current I_{th} in1 sec.(100-1000) × I_n	Max.kA	60	60	60	60
Rated dynamic current I_{dyn} = 2.5 × I_{th}	Max.kA	120	120	120	120
Max. number of cores (Depends on burden , accuracy class , Ith value)		2	3	2	3
Accuracy class measuring / protection		0.2-0.5-1/5P -10P			
Rated output (measuring / protection)		5-30VA/1-30 VA			
Instrument security factor (measuring; FS5,FS10)/ Accuracy limit factor (protection; P5-P30)					

On Request:

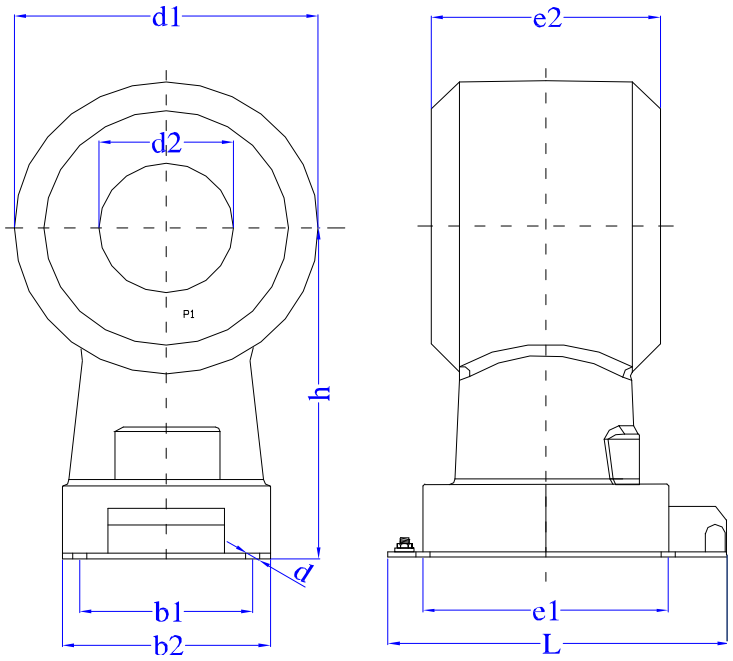
Constructions with capacitive layer

AMD Series : suitable for $I_{primary} \geq 2000$ A

AMD12-AMDL12-AMD24- AMDL24

Type	AMD12 AMD24	AMDL12 AMDL24
e1	210	280
L	292	362
e2	196	266
b2	178	178
h	295	295
d	12	12
d1	260	260
d2	115	112
b1	148	148

Dimensions in mm



MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument voltage transformers, indoor, Cast-Resin Insulated

Technical data

Type		VM24-1	VM36-1	VM12-2	VM24-2
Highest voltage for equipment	kV	24	36	3.6,7.2,12	24
Power frequency withstand test voltage, 1 minute	kV	50	70	10,20,28	50
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	125	170	40,60,75	125
Rated frequency	Hz	50/60	50/60	50/60	50/60
Max. rated primary voltage	kV	24/√3	36/√3	12	24
Secondary thermal limit current for measuring winding	A	12	14	6	7
Rated voltage factor /8h		1.9	1.9	-	-
Secondary thermal limit current for Earth – fault winding	A	6	6	-	-
Secondary voltage	V	100/√3; 110/√3; 220/√3		100;110;220	
Max number of cores		3	3	2	2
Accuracy class measuring / protection		0.2-0.5-1-3/3P -6P			
Rated output		10-200 VA			

On Request:

- Secondary change over provides dual primary rated voltage for instance (20000-11000/100V).
- Additional winding for earth–fault detection or open-delta protection In single pole Transformers (100/3 V or 110/3 V)
- Double pole voltage transformer can be used as a power supply transformer with accuracy class 3 (CL3/500 VA).

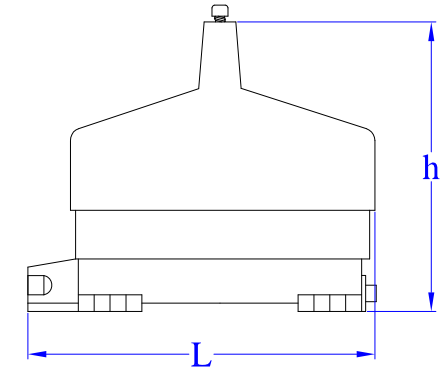
VM Series (old model) : Suitable for spare part

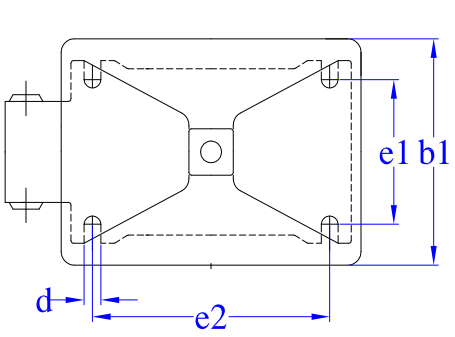
Type	VM24-1	VM36-1
e1	200	200
e2	250	250
L	366	366
b1	270	270
h	300	390
d	14	14

Type	VM12-2	VM24-2
e1	200	200
e2	250	250
e3	210	210
L	366	366
b1	270	270
h	300	300
d	14	14

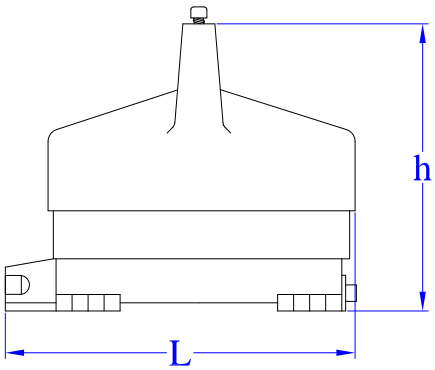
Dimensions in mm

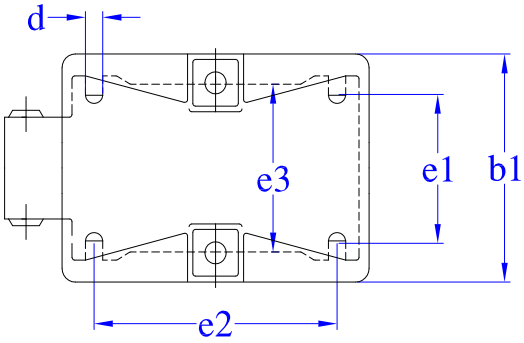
VM24-1/VM36-1





VM12-2/VM24-2





MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument voltage transformers, indoor, Cast-Resin Insulated

Technical data

Type		VMB12-1	VMB24-1	VMD12-2 VMB12-2	VMD24-2 VMB24-2
Highest voltage for equipment	kV	3.6,7.2,12	24	3.6,7.2,12	24
Power frequency withstand test voltage, 1 minute	kV	10,20,28	50	10,20,28	50
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40,60,75	125	40,60,75	125
Rated frequency	Hz	50/60	50/60	50/60	50/60
Max. rated primary voltage	kV	12/√3	24/√3	12	24
Secondary thermal limit current for measuring winding	A	7	7	4	4
Rated voltage factor /8h		1.9	1.9	-	-
Secondary thermal limit current for Earth – fault winding	A	4	4	-	-
Secondary voltage	V	100/√3; 110/√3; 220/√3		100;110;220	
Max number of cores		3	3	1	1
Accuracy class measuring / protection		0.2-0.5-1-3/3P -6P			
Rated output		10-100 VA			

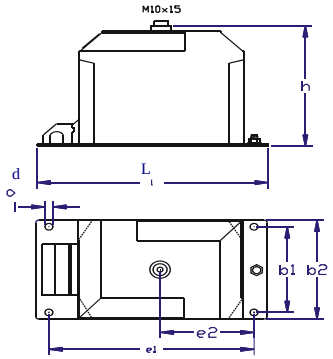
On Request:

- Secondary change over provides dual primary rated voltage for instance (20000-11000/100V).
- Additional winding for earth–fault detection or open-delta protection In single pole Transformers (100/3 V or 110/3 V)

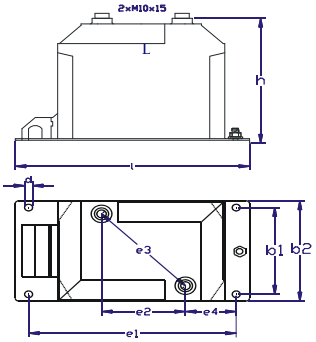
Type	VMB12-1 VMB24-1	VMD12/24-2 VMB12/24-2
e1	280	280
e2	140	165
e3	-	210
e4	-	58
L	362	362
b1	148	148
b2	178	178
h	250	280 250
h1	-	35
d	14	14

Dimensions in mm

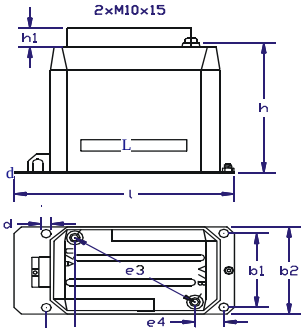
VMB12/24-1



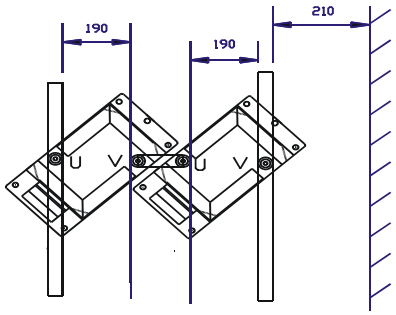
VMB12/24-2



VMD12/24-2



Tested Terminal Zones for



MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument voltage transformers, indoor, Cast-Resin Insulated

Technical data

Type		VMS12-1	VMS24-1	VMS24-2
Highest voltage for equipment	kV	3.6,7.2,12	24	24
Power frequency withstand test voltage, 1 minute	kV	10,20,28	50	50
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40,60,75	125	125
Rated frequency	Hz	50/60	50/60	50/60
Max. rated primary voltage	kV	12/√3	24/√3	24
Secondary thermal limit current for measuring winding	A	7	7	4
Rated voltage factor /8h		1.9	1.9	-
Secondary thermal limit current for Earth – fault winding	A	4	4	-
Secondary Voltage	V	100/√3; 110/√3; 220/√3		100;110;220
Max number of cores		3	3	1
Accuracy class measuring / protection		0.2-0.5-1-3 /3P -6P		
Rated output		10-100 VA		

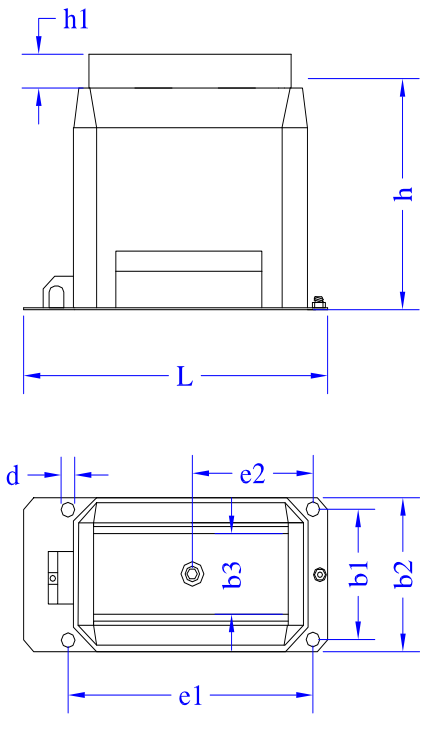
On Request:

- Secondary change over provides dual primary rated voltage for instance (20000-11000/100V).
- Additional winding for earth–fault detection or open-delta protection in single pole transformers (100/3 V or 110/3 V).
- Double pole voltage transformer can be used as a power supply transformer with accuracy class 3 (CL3/500 VA).

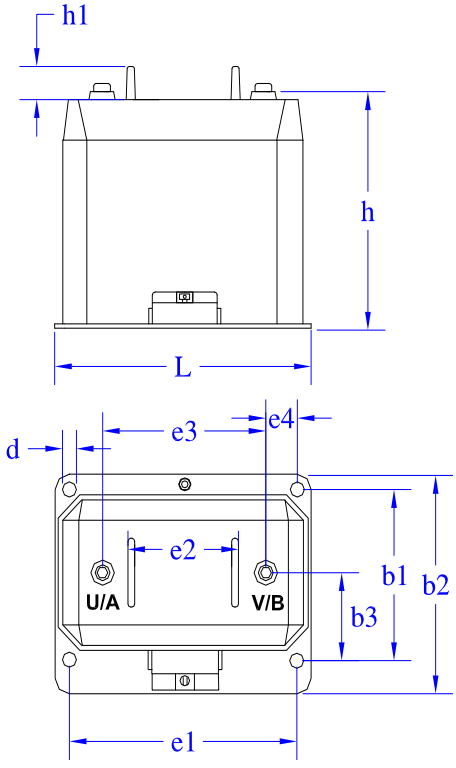
*** Ribs on the top for increasing creepage distance. (20kV)**

Type	VMS12-1	VMS24-1	VMS24-2
e1	270	280	256
e2	135	140	120
e3	-	-	210
e4	-	-	23
L	342	362	290
b1	125	148	185
b2	148	178	255
b3	-	80	93
h	220	280	280
h1*	-	35	35
d	14	14	14

VMS12/24-1



VMS24-2



Dimensions in mm

MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument voltage transformers, indoor, Cast-Resin Insulated

Technical data

Type		VMF12-F VMF12-1	VMF24-F VMF24-1	VMFD24-F VMFD24-1	VMF36-F VMF36-1
Highest voltage for equipment	kV	3.6,7.2,12	24	24	36
Power frequency withstand test voltage, 1 minute	kV	10,20,28	50	50	70
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40,60,75	125	125	170
Rated frequency	Hz	50/60	50/60	50/60	50/60
Max. rated primary voltage	kV	12/√3	24/√3	24/√3	36/√3
Secondary thermal limit current for measuring winding	A	7	7	7	7
Rated voltage factor /8h		1.9	1.9	1.9	1.9
Secondary thermal limit current for Earth – fault winding	A	4	4	4	4
Secondary Voltage	V	100/√3; 110/√3; 220/√3			
Max number of cores		3	3	3	3
Accuracy class measuring / protection		0.2-0.5-1-3 /3P -6P			
Rated output		10-100 VA			

On Request:

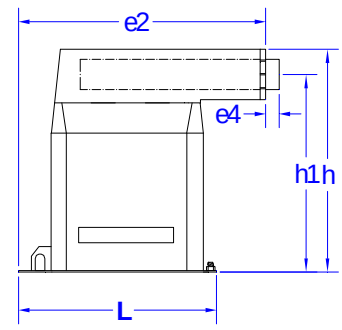
- Secondary change over provides dual primary rated voltage for instance (20000-11000/100V).
- Additional winding for earth–fault detection or open-delta protection (100/3 V or 110/3 V)

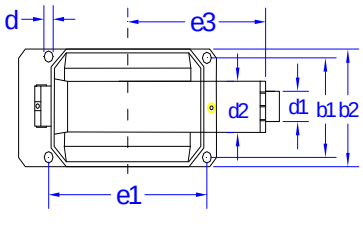
VMFxx-F Series : fixed type with horizontal fuse
VMFxx-1 Series : drawable type with horizontal fuse

Type	VMF12-F VMF12-1	VMF24-F VMF24-1	VMFD24-F VMFD24-1	VMF36-F VMF36-1
e1	270	280	280	300
e2	460	480	600	700
e3	270	280	280	500
e4	30	30	30	30
L	342	362	362	395
b1	125	148	148	190
b2	148	178	178	220
h	280	340	340	435
h1	240	300	300	390
d	12	14	14	14
d1	45	45	45	45
d2	75	75	75	90

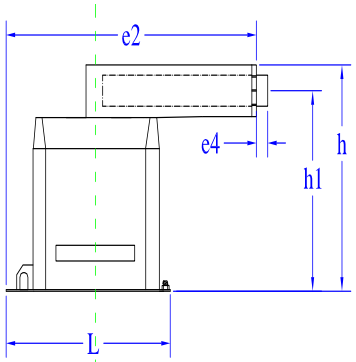
Dimensions in mm

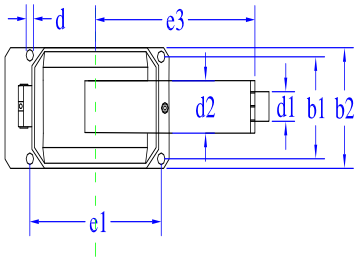
VMF24-1 / VMF36-1





VMF12-1 / VMFD24-1





MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument voltage transformers, indoor, Cast-Resin Insulated

Technical data

Type		VMV12-F VMV12-1	VMV24-F VMV24-1	VMV36-F VMV36-1
Highest voltage for equipment	kV	3.6,7.2,12	24	36
Power frequency withstand test voltage, 1 minute	kV	10,20,28	50	70
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40,60,75	125	170
Rated frequency	Hz	50/60	50/60	50/60
Max. rated primary voltage	kV	12/√3	24/√3	36/√3
Secondary thermal limit current for measuring winding	A	7	7	7
Rated voltage factor /8h		1.9	1.9	1.9
Secondary thermal limit current for Earth – fault winding	A	4	4	4
Secondary Voltage	V	100/√3; 110/√3; 220/√3		
Max number of cores		3	3	3
Accuracy class measuring / protection		0.2-0.5-1-3 /3P -6P		
Rated output		10-100 VA		

On Request:

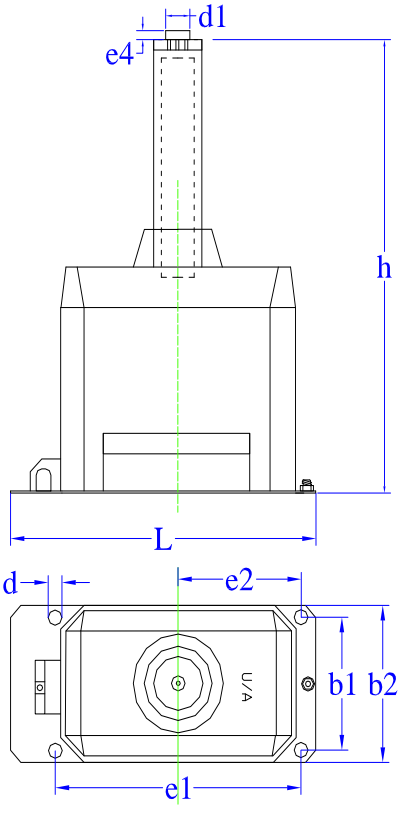
- Secondary change over provides dual primary rated voltage for instance (20000-11000/100V).
- Additional winding for earth–fault detection or open-delta protection (100/3 V or 110/3 V)

VMVxx-F Series : fixed type with vertical fuse
VMVxx-1 Series : drawable type with vertical fuse

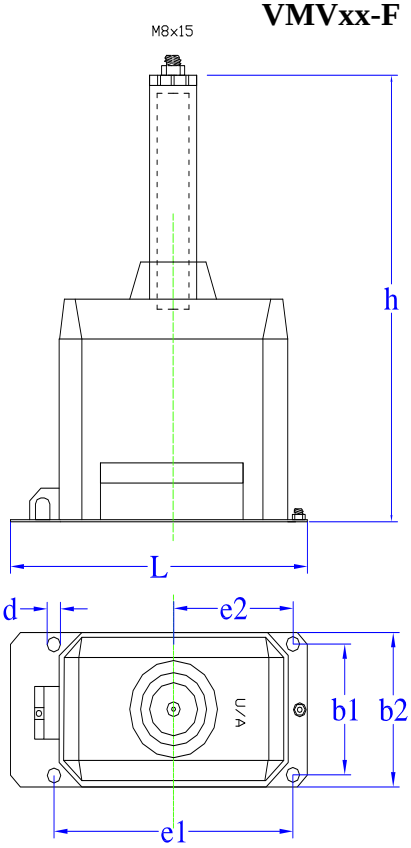
Type	VMV12-F VMV12-1	VMV24-F VMV24-1	VMV36-F VMV36-1
e1	270	280	300
e2	135	140	150
e4	30	30	30
L	342	362	395
b1	125	148	190
b2	148	178	220
h	500	610	660
d	12	14	14
d1	45	45	45

Dimensions in mm

VMVxx-1



VMVxx-F



MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6kV up to 36 kV

Instrument voltage transformers, indoor, Cast-Resin Insulated

Technical data

Type		VMI12-1	VMI24-1	VMS36-1 VMI36-1
Highest voltage for equipment	kV	3.6,7.2,12	24	36
Power frequency withstand test voltage, 1 minute	kV	10,20,28	50	70
Lightning impulse test voltage (1.2/50 μ s full wave)	kV	40,60,75	125	170
Rated frequency	Hz	50/60	50/60	50/60
Max. rated primary voltage	kV	12/√3	24/√3	36/√3
Secondary thermal limit current for measuring winding	A	7	7	7
Rated voltage factor /8h		1.9	1.9	1.9
Secondary thermal limit current for Earth – fault winding	A	4	4	4
Secondary Voltage	V	100/√3; 110/√3; 220/√3		
Max number of cores		3	3	3
Accuracy class measuring / protection		0.2-0.5-1-3 /3P -6P		
Rated output		10-100 VA		

On Request:

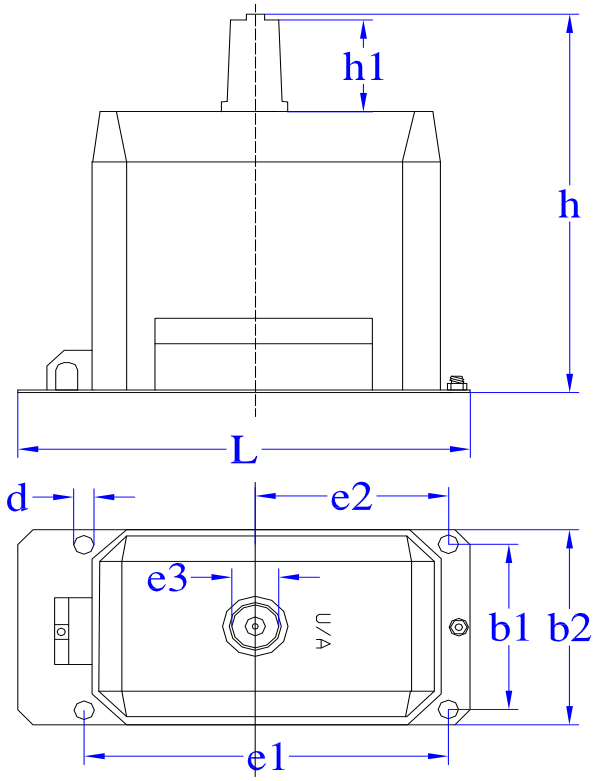
- Secondary change over provides dual primary rated voltage for instance (20000-11000/100V).
- Additional winding for earth–fault detection or open-delta protection (100/3 V or 110/3 V)

VMI Series : Suitable for polluted aria (high humidity,…)

Type	VMI24-1 VMI12-1	VMS36-1 VMI36-1
e1	280	300
e2	140	150
e3	46	46
L	362	395
b1	148	190
b2	178	220
h	366	390
h1	102	102
d	14	14

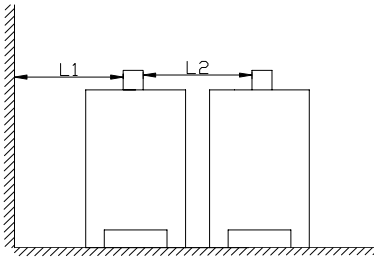
Dimensions in mm

M 16x40

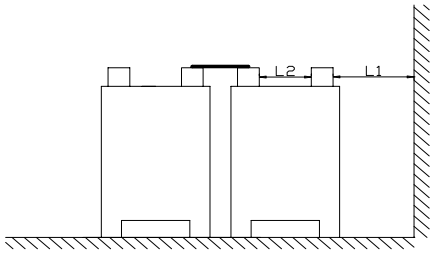


MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6 kV up to 36 kV



a) Single-pole PTs and CTs



b) Double-pole PTs

Minimum clearance according to IEC 71-2

U_{max}/kV	L_1/mm	L_2/mm
12	**110**	**100**
24	**210**	**190**
36	**290**	**270**

Medium Voltage Instrument Transformers:

These transformers transform primary currents and voltages true to scale and true to phases into measurable, standardized currents (I) or voltages (V). Furthermore they electrically insulate the connected measurement and protection equipment against those parts of the installation that are under high voltage.

Medium-voltage instrument transformers are current and voltage transformers which are designed for rated voltages from 3-36 kV.

Standards:

Our instrument transformers comply with the requirements of IEC60044-1 (current transformer) IEC60044-2 (voltage transformer) and ISIRI 6198-1,2 "rules for instrument transformers." The following is a list of standards and rules applicable in Iran and various foreign countries:

International	IEC60044-1, 2
Iran	ISIRI6198-1, 2
Germany	DIN VDE 0414
USA	ANSI C 57.13
England	BS 3938
	BS 3941

Terms:

Highest voltage for equipment:

The highest r.m.s phase-to-phase voltage for which a transformer is designed with respect to it's insulation.

Rated frequency:

This is the frequency for which the transformer is designed. It is given in Hz on the rating plate.

Insulation Capacity:

Test voltages and insulation levels for instrument transformers:

The insulation capacity is proven by the following tests:

Lightning impulse-voltage test (type tests)

Power frequency withstand test on primary windings (routine test)

Power frequency withstand test on secondary windings and between sections (routine test)

Partial discharge test (routine test)

All transformers conform to insulating material class **E**, i.e. max temperature rise 75 K.

Rated insulation levels for transformer primary windings having highest voltage for equipment Um<36 kV		
highest voltage for equipment Um(r.m.s) kV	**Rated power frequency withstand voltage (r.m.s) kV**	**Rated lightning impulse withstand voltage(peak) kV**
1.2	6	_
3.6	10	20/40
7.2	20	40/60
12	28	60/75
17.5	38	75/95
24	50	95/125
36	70	145/170

Partial discharge test :
In order to check the insulation of current and voltage transformers, it is necessary to perform partial discharge tests in addition to the previous tests mentioned. Partial discharge means any weak, short-duration, electrical discharge occurring at or in a test object when it is subjected to the applied voltage.
The discharges occur as soon as the partial discharge inception voltage of the insulant is exceeded at any point. Relatively high field intensities are produced at sharp edges and tips of metal parts and also at voids and gas inclusions in solid or liquid insulants.
The partial discharges behave like HF transmitters and generate a mixture of widely different frequencies.
The partial discharge measurement enables the homogeneity of the insulant to be assessed.
The partial discharge test on inductive transformers with solid insulation for voltages in excess of Um =3.6 kV is performed as a routine test.

Partial discharge test voltages and permissible levels		
Type of earthing of the system	**PD test voltage (r.m.s) kV**	**Permissible PD level pC**
Earthed neutral system (earth fault factor≤1.5)	U_m 1.2Um/√3	50 20
Isolated or non effectively earthed neutral system (earth fault factor >1.5)	1.2 U_m 1.2 Um/√3	50 20

CURRENT TRANSFORMERS:
Function:
Current transformers must transfer the primary current within the working range as proportional as possible .We distinguish between:
Current transformers for measuring
Current transformers for protection
Current transformers for measuring are provided for connection of measuring equipment, meters and similar equipment. Current transformers for protection can be connected to protection devices of any type. They are marked with the letter "P" after the accuracy class.
Operation:
Current transformers are transformers of small output. Their secondary windings are practically short – circuited through connected measuring equipment, meters, etc. (short – circuited transformer)
Constructional Characteristics:
Rated current: (r.m.s value in A)
The rated values of primary and secondary current are given on the rating plate, the usual values for primary current in A are:
10 ; 12.5 ; 15 ; 20 ; 25 ; 30 ; 40 ; 50 ; 60 ; 75
and their decimal multiples. The preferred values are underlined. Usual values for secondary current are: 1 and 5A.
For technical reasons, but above all for reasons of economy, a secondary current of 1 A is recommended, particularly in the case of long measuring leads.

Rated continuous thermal current:
This is the current intensity in the primary winding at which the permissible temperature rise is not exceeded, the secondary winding being subject to the rated burden.

Rated thermal short-circuit current I_{th}
This is the r.m.s. value of the primary current that the current transformer can withstand for one second without sustaining damage.
For other times (t'≠1s) the following formula can be applied: $\boxed{(I'_{th})^2.t' \leq (I_{th})^2.1\ s}$

Rated peak withstand current:
This is the peak value of the primary current, the force effect that the current transformer can withstand without sustaining electrical or mechanical damage.

Rated transformation ratio:
This is the ratio of rated primary current to rated secondary current.
It is given as a ratio, e.g. 500 /1 A.

Current error (ratio error):
The current error of a current transformer is:

$$\text{Current error \%} = \frac{K_N.I_S - I_P}{I_p}.100$$

K_N=Rated transformation ratio
I_P=Actual primary current
I_S=Actual secondary current

Phase error:
This is the difference in the phase between the primary and secondary current pointer. The direction of the pointer is determined such that on an ideal current transformer, the phase error is equal to 0.
The phase error is taken as positive if the pointer for secondary current leads that of the primary current. It is usually expressed in angular minutes.

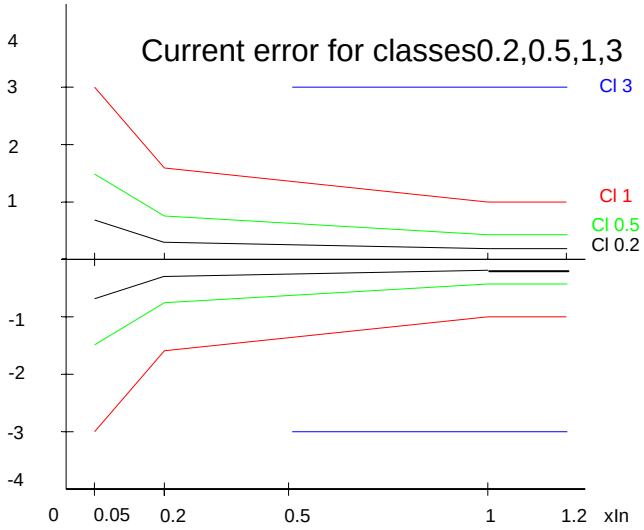
Accuracy class:
The accuracy class depends on the type of installation to be used (metering or protection, etc.) The accuracy class means that the conversion error does not exceed the indicated value in %. Current factor is the percentage deviation of the secondary current.
The phase displacement between primary and secondary current, which occurs simultaneously, is called phase angle δ. It is indicated in minutes or centiradians.
Accuracy must be held with a load from 25% to 100% of the rated burden (for cases 3 and 5 from 50 to 100% of the rated burden. acc. IEC 60044-1). It must be noted the accuracy of a current transformer depends on its load. Therefore, all class indications refer to rated burdens. If the load deviates, the transformer might not keep the indicated accuracy -under certain conditions-.

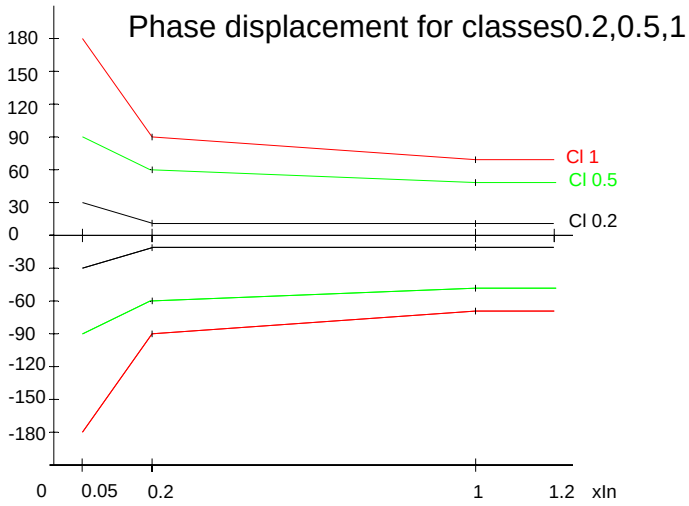
Limits of current error and phase displacement for measuring current transformers (class from 0.2 to 1)

Accuracy class	**±percentage current (ratio) error at percentage of rated current shown below**				**±phase displacement at percentage of rated current shown below**			
					Minutes			
	5	20	100	120	5	20	100	120
0.2	0.75	0.35	0.2	0.2	30	15	10	10
0.5	1.5	0.75	0.5	0.5	90	45	30	30
1	3	1.5	1	1	180	90	60	60

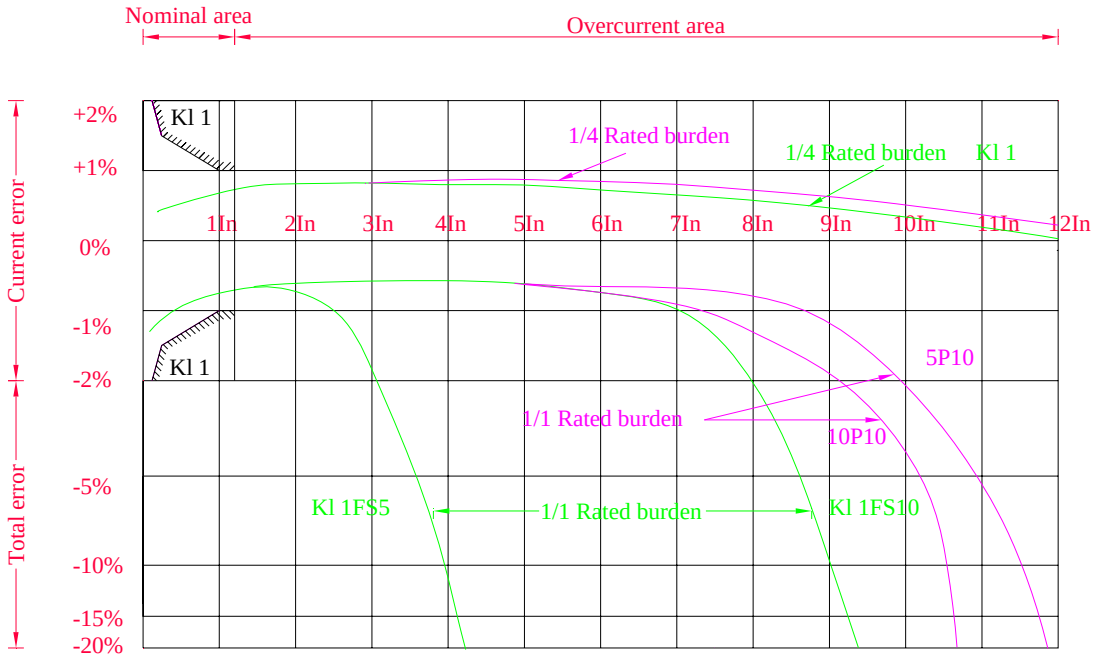
MAG ELECTRIC Co.

Instrument current & voltage transformers
3.6 kV up to 36 kV





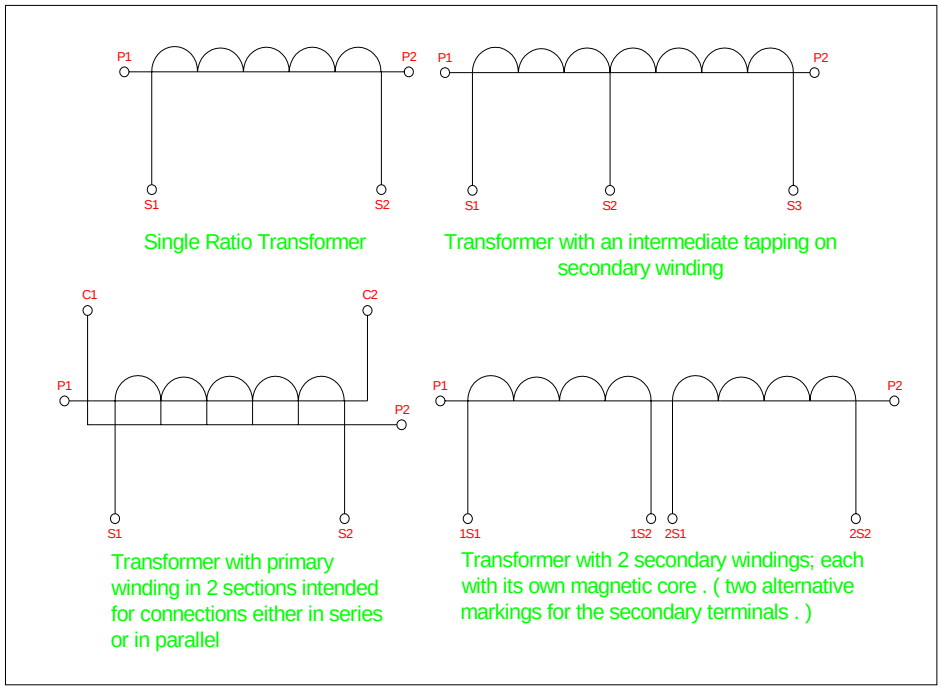
Accuracy class limits for current transformers



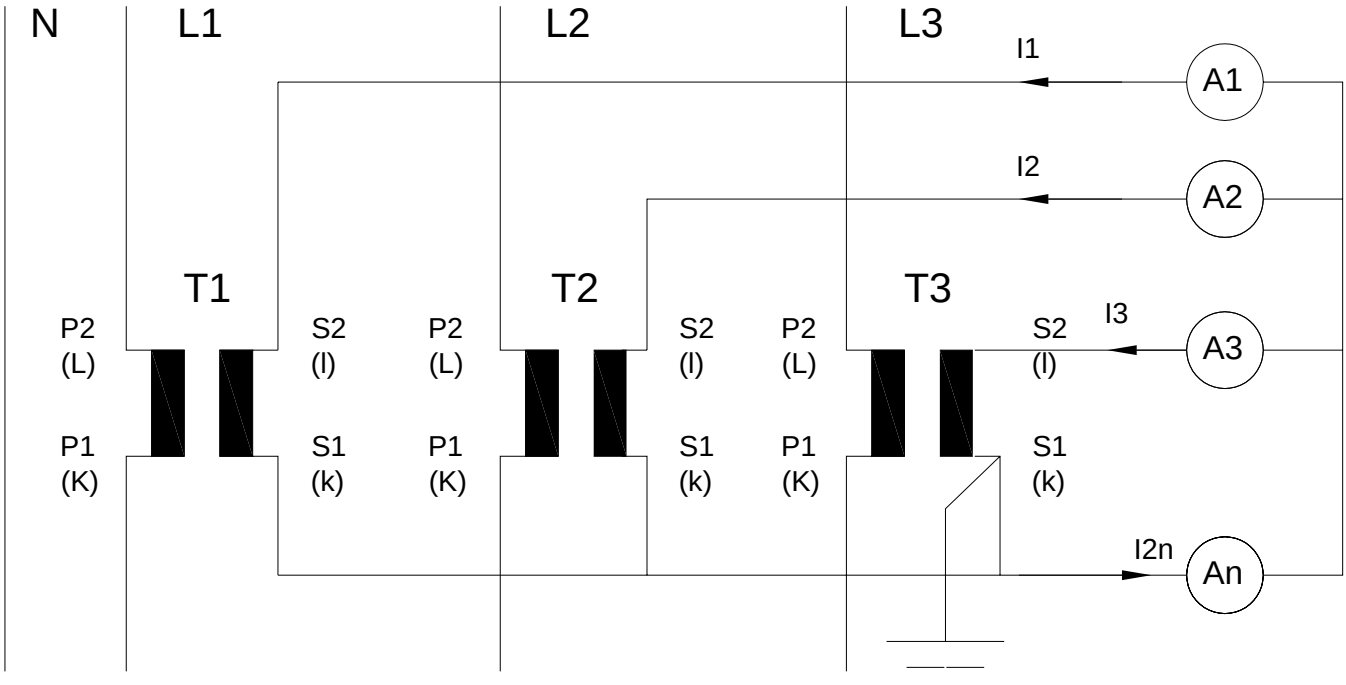
Overcurrent characteristics of transformers with instrument security factor & accuracy limit factor

MAG ELECTRIC Co.
Instrument current & voltage transformers
3.6 kV up to 36 kV

Terminal markings according to IEC60044-1
Current Transformer



Example of the current transformer connections



Current transformers for protection:
Intended for use with electrical protection devices (e.g. 15VA10P10). A current transformer for protection is classified in class 10P and 5P expressing in terms of the secondary terminal performance:
1) Accuracy class at rated current.
2) Rated composite error at accuracy limit current in percent.
The accuracy class 5P requires a higher demand in construction of the cord as than the accuracy class 10P.
The accuracy limit factor is given by the figure behind the accuracy class designation 10P and 5P respectively.

Limits of error for protective current transformers			
Accuracy class	**current error at rated primary current %**	**phase displacement at rated primary current** **Minutes**	**composite error at rated accuracy limit primary current %**
5P	±1	±60	5
10P	±3	-	10

Nominal output:
The nominal output of a current transformer indicates its apparent power. It is always indicated in VA. The sum of power consumption of the connected measuring and protection devices together with the secondary supply lines indicates the nominal output according to which a transformer must be designed.
However, the maximum output also depends on the available space for the core(s) depending the total dimensions of the transformer.
Current transformers may have the following preferred nominal outputs: **2.5; 5; 10; 15; 30 VA**.
Accuracy characteristics under over current:
In the event of over-current the secondary current increases in proportion with the primary current up to the rated limiting current value.
The accuracy limits stated are met only at rated burden of the transformer.
If the operating burden deviates from the rated burden of the transformer, the over current limiting factor varies as follows:

$$n' = n. \frac{S_N + S_E}{S + S_E}$$

n'= Actual over-current limiting factor
n = Rated over-current limiting factor
S_N =Rated burden in VA
S_E =Transformer consumption in VA (approx. 5% to 20% of S_N)
S= Actual connected burden in VA
Capacitively coupled voltage detection system:
The directives for all modern medium-voltage switchgears include stipulations that doors and covers must not be opened until the danger of electric shock (from touching) has been eliminated. The portable single-pole voltage detectors used hitherto are suitable.
All modern medium-voltage switchgears are therefore offered including a system with a fixed, mounted capacitive divider.

The indicator comprises a glow lamp which burned if voltage is present with following conditions:
Indicating range: at 0.01 × U_N no indication.
From 0.40 × U_N reliable indication.

Important for ordering:
When transformers with capacitive layer are ordered, it is necessary to state the actual operating voltage U_N.
e.g. Um=24 kV, U_N=15 kV.

Re-connectablity of current transformers:
If the transmission ratio of current transformers is to be variable (e.g. for planned system expansion), it is possible to use re-connectable current transformers.
Primary- side reconnection:
Only possible on wound transformers in the ratio 1:2 (e.g.2 × 600/1 A).
Reconnection is performed by changing over copper lugs in the primary terminal region. Outputs, over-current limiting factors and secondary internal resistance remain unchanged by reconnection.
Secondary-side changeover:
This can be performed on single-conductor and wound transformers by tappings on the secondary windings (e.g.2000-1500A/1A).
Outputs or over-current limiting factors change roughly with the transformation ratio.
Where not otherwise stated, the rated data given refer always to the higher current value.
Special versions:
Extended current measuring range:
Current transformers of 200% extended range can be operated continuously at 2 × I_n while maintaining the accuracy limits of their class in the range up to 200% of the rated primary current.
VOLTAGE TRANSFORMERS:
Function:
Voltage transformers are instrument transformers whose secondary voltage is proportional in magnitude and coincidental in phase to their primary voltage. They must transform the main voltage to be measured into a proportional value that feeds measuring equipment as well as protection devices. Simultaneously, the primary and secondary windings must be galvanically separated. We distinguish between the following:

- Single–pole insulated voltage transformers
- Double–pole insulated voltage transformers

At single–pole insulated voltage transformers, one end of HV-winding lies on earth potential. The other end of the HV–winding is insulated for the maximal occurring operation voltage (U_{max}). Single–pole insulated transformers measure phase voltage against earth ($U_N/\sqrt{3}$).
Double–pole insulated transformers measure the interlinked voltage (line to line). Both poles are insulated for the maximal occurring operation voltage (U_{max}) and must be designed in such a fashion that the measuring accuracy will not be influenced even when one pole is switched against earth
Operation:
Due to small connected burdens, the windings of voltage transformers are practically working on no-load running.
Constructional characteristics:
Rated primary voltage:
There is a difference between voltage transformers for phase-to-earth voltage or for line –to-line voltage.
Therefore there are two types of design, i.e. single–pole or double-pole insulated voltage transformers. As mentioned before, the insulation between primary and secondary winding of a double-pole insulated voltage

transformer must be designed according to the line voltage, whereas the phase voltage of a single-pole insulated voltage transformer will be reduced from the outside to inside.

Ratio:
The transformation ratio determines the necessary number of turns for the primary and secondary winding.
Rated output:
This is the value of apparent power (in VA at a specified power factor) that the Voltage transformer gives out at rated secondary voltage and rated burden.

accuracy class	Rated outputs(VA)						
0.2	10	15	30	50	_	_	_
0.5	10	15	30	50	75	100	_
1	_	_	30	50	75	100	200

Voltage error:
The voltage error expressed as a percentage is given by the formula

$$\text{voltage error \%} = \frac{(K_N.U_S - U_P)}{U_P} .100$$

K_N = Rated transformation ratio
U_P = Actual primary voltage
U_S =Actual secondary voltage when U_P is applied under measuring conditions.
Phase error
This is the difference in angle between the primary and secondary voltage pointer.
The phase error is taken positive if the pointer for secondary voltage leads that of the primary voltage.
It is expressed in angular minutes.
Limits for voltage error and phase error:
Voltage error and phase error must not exceed the values stated in the table at voltages between 80% and 120% of rated voltage (at rated frequency, for secondary burdens of 25% to 100% of rated burden and at a power factor of 0.8 inductive).

	accuracy class	±Voltage error %	±phase error Minutes
for measurment	0.2	0.2	10
	0.5	0.5	20
	1	1	40
for protection 0.05U_N&rated voltage factor x U_N	3P	3	120
	6P	6	240

Limiting thermal output:
The apparent power which the voltage transformer can supply to the secondary circuit without exceeding the stipulated temperature limits at rated primary voltage.
Rated secondary limiting thermal output:
The output of the winding for earth –fault monitoring at rated voltage and a time of 8h . As the windings for the earth–fault monitoring are connected in open delta they will be permanently charged in case of an earth–fault

Rated voltage factor:
Earthed voltage transformers can be operated 1.9 times the rated primary voltage for a time of 8h without exceeding the stipulated temperature limits. This only happens in case of an earth-fault.

Change over:
Similar to the current transformers, a voltage transformer can also be designed with a change over.
The most frequent means of change over is the secondary tapping.
When switching over to half the primary voltage by means of the secondary tapping, the number of turns W2 must be doubled. This causes an enlargement of the effective resistance and reactance, resulting in an increase of error or a reduction of output.

Residual voltage winding:
In order to register an earth-fault, single-pole transformers can be equipped with an additional secondary winding, i.e. the residual voltage winding. This auxiliary winding is connected in a broken delta together with the windings of the transformers of the remaining phases for:
1) Producing a residual voltage under earth-fault
2) Damping of relaxation oscillations (ferro-resonans)
The preferred values of the secondary voltages are acc. IEC60044-2
The rated thermal limiting output is specified in volt-amperes for duration of 8h.
Note: since the residual voltage windings are connected in a broken delta, the windings are only loaded under fault conditions.
The accuracy class shall be 3P or 6P (for damping purposes, an accuracy class designation is not mandatory).
ATTENTION! Ground leakage on two phases must be avoided, because as a result a secondary winding will be short–circuited through earth

Permissible torques for screw connections:

M5	max/Nm/…3.5	min/Nm/…2.8
M8	max/Nm/…20	min/Nm/…16
M12	max/Nm/…70	min/Nm/…56
M10	max/Nm/…20	(only For Voltage transformers)

ORDERING PROCEDURES:
In order to guarantee a flawless execution of the order, we need the following information from you:

Current transformers
Ratio (Primary current /Secondary current)
Output /Accuracy class / Instrument security factor or Accuracy limit factor
I_{th}/ I_{dyn}
Frequency
Insulation level
Operation voltage
Capacitive layer (yes / no)

Voltage transformers
Single or Double pole
Ratio (primary /secondary voltage)
Output /Accuracy class
Thermal limiting output
Rated thermal limiting output
Frequency
Operating voltage
Insulation level

Laboratory of Medium Voltage Instrument Transformers Production Line

Faraday Chamber for Power Frequency , Partial Discharge and Insulation Test

Winding part of Medium Voltage Production Line

Vaccum Casting : Part of Medium Voltage Production Line